DESIGN, CONSTRUCTION, OPERATION OF METAL-WORKING AND ALLIED EQUIPMENT

MACHINERY

NOVEMBER, 1941

Equipment designed for the special needs of aircraft factories will be the subject of the leading article in December MACHINERY. In airplane factories there are a large number of operations that have no exact counterpart in other metal-working shops. For such operations, the engineers of the aircraft-building industry are often called upon to develop special machines or tooling. Other articles in December will cover adequate lighting in industrial plants; automatic precision control of boring mills; and munitions cleaning.

Volume 48
Number 3

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In a little private experiment the hired man coated his overalls with a solution of gum and alcohol, which on drying cemented him so firmly to his bench that he was cut loose with a shears. It was a pointer to Charles Goodyear that the stickiness was in the gum itself and not due to solution as previously thought.

MACHINERY

Volume 48 NEW YORK, NOVEMBER, 1941 Number 3

American Shipyards Meet the Axis Challenge

"Ships and still more ships, speed and still more speed"—that stirring battle-cry sounded last January by the President of the United States—is being re-echoed in shipyards extending from the New England Coast down along the Atlantic, across the Gulf of Mexico and up the Pacific. American shipyards everywhere are exerting almost superhuman efforts in building oil tankers and freighters to replace the tonnage being destroyed by Axis marauders, and in constructing fighting vessels to make our two-ocean Navy a reality by 1944.

More than $3,000,000,000 worth of cargo-carrying vessels are called for in the program of the United States Maritime Commission. When this program is fully under way next year, these ships will be launched at the rate of two a day—already they go down the ways at the rate of one daily. The program of the United States Navy is even more impressive, a total of 2831 ships having been contracted for at a cost of over $7,000,000,000. One thousand of these naval vessels are actually under construction today.

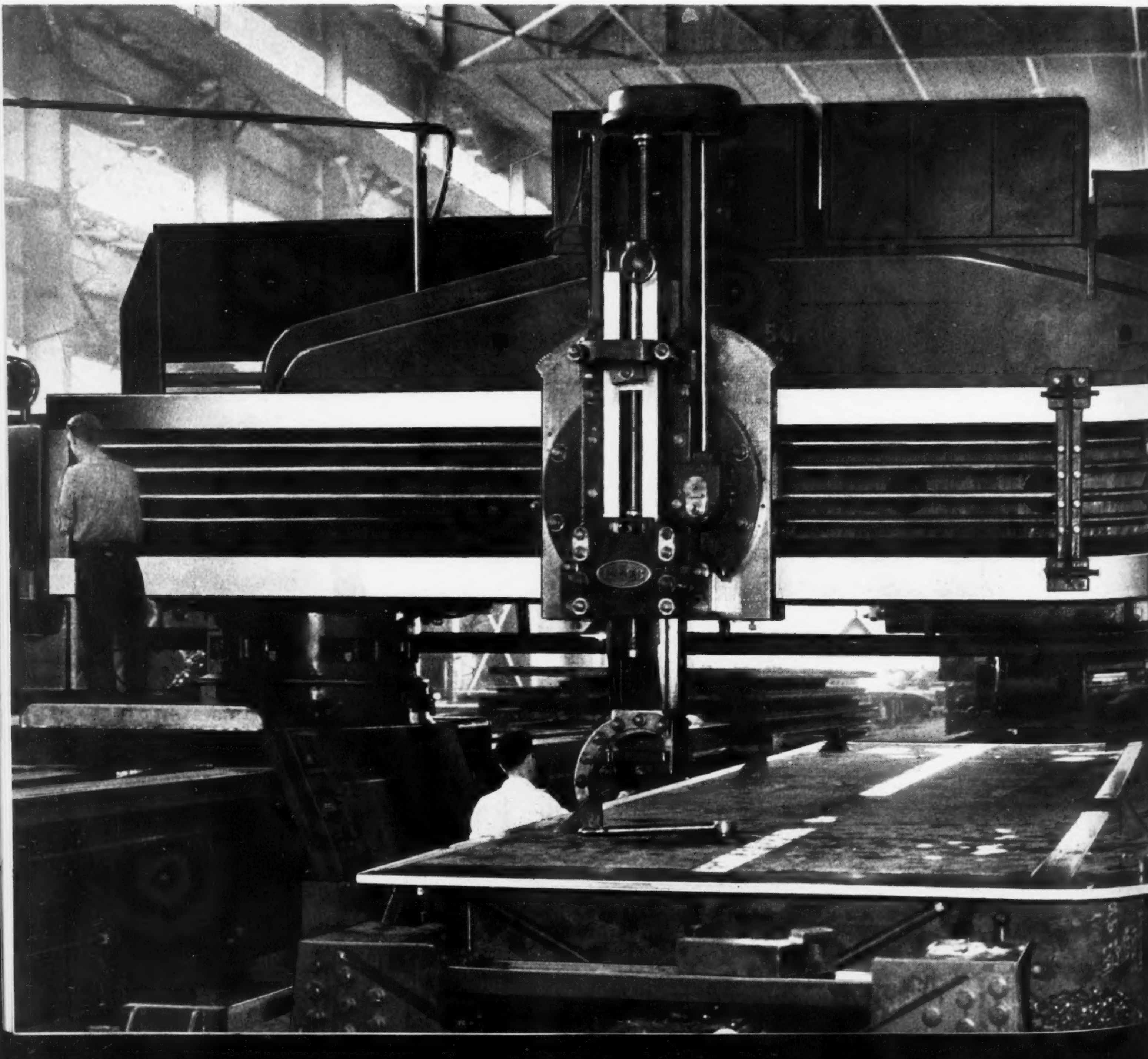
Machine tools and other metal-working, plate-cutting, welding, and riveting equipment are winning this production battle. How this is being accomplished is outlined in the following articles, which were made possible through the cooperation of the Navy Department. These articles describe typical production methods in the largest navy yard in the world and in outstanding privately owned shipyards.

World's Largest Navy Yard

Through Sagacious Expenditure of Funds Made Available by Congress, the Philadelphia Navy Yard has Brought its Shops to the Highest Level of Production Efficiency

By CHARLES O. HERB

THE United States Navy Yard at Philadelphia has been expanded tremendously during the last few years, in common with the other shipyards operated by the Navy Department. Whereas the plant valuation at the end of June, 1940, was $70,000,000, an additional $85,000,000 has been expended since for the expansion of facilities, and today they are double that of a year and a half ago. There are 25,000 employes now, compared with 10,000 at the beginning of the present national emergency. The entire Philadelphia Navy Yard comprises 1030 acres, of which 685 acres consist of land and 345 acres of water in a so-called back-



Builds for Democracy's Defense

channel reserve basin. All together, the waterfront extends a distance of 7.8 miles.

Including production facilities and the yard area, this Navy Yard is believed to be the largest and most completely equipped in the world. It is essentially a battleship building yard, and its shipways, drydocks, and shipbuilding docks have been built with such a program in mind, but the Yard also builds other types of vessels and overhauls all kinds of ships. In the latter connection, it is of interest to note that during the present emergency, this shipyard, in record time, has reconditioned all of the World War destroyers, submarines, and tankers that had been laid up at that yard, and has also converted four destroyers for special services, and fitted out a number of tenders. This has gone on simultaneously with the construction of new vessels, shops, and building docks.

By the use of building docks, large ships are constructed in what amount to drydocks equipped with overhead traveling cranes. When these ships are practically completed, they are floated by merely letting water into the dock. One of the important advantages of this method of shipbuilding is the elimination of the huge cost involved in launching a large battleship from ways—\$300,000 to \$500,000—as few persons

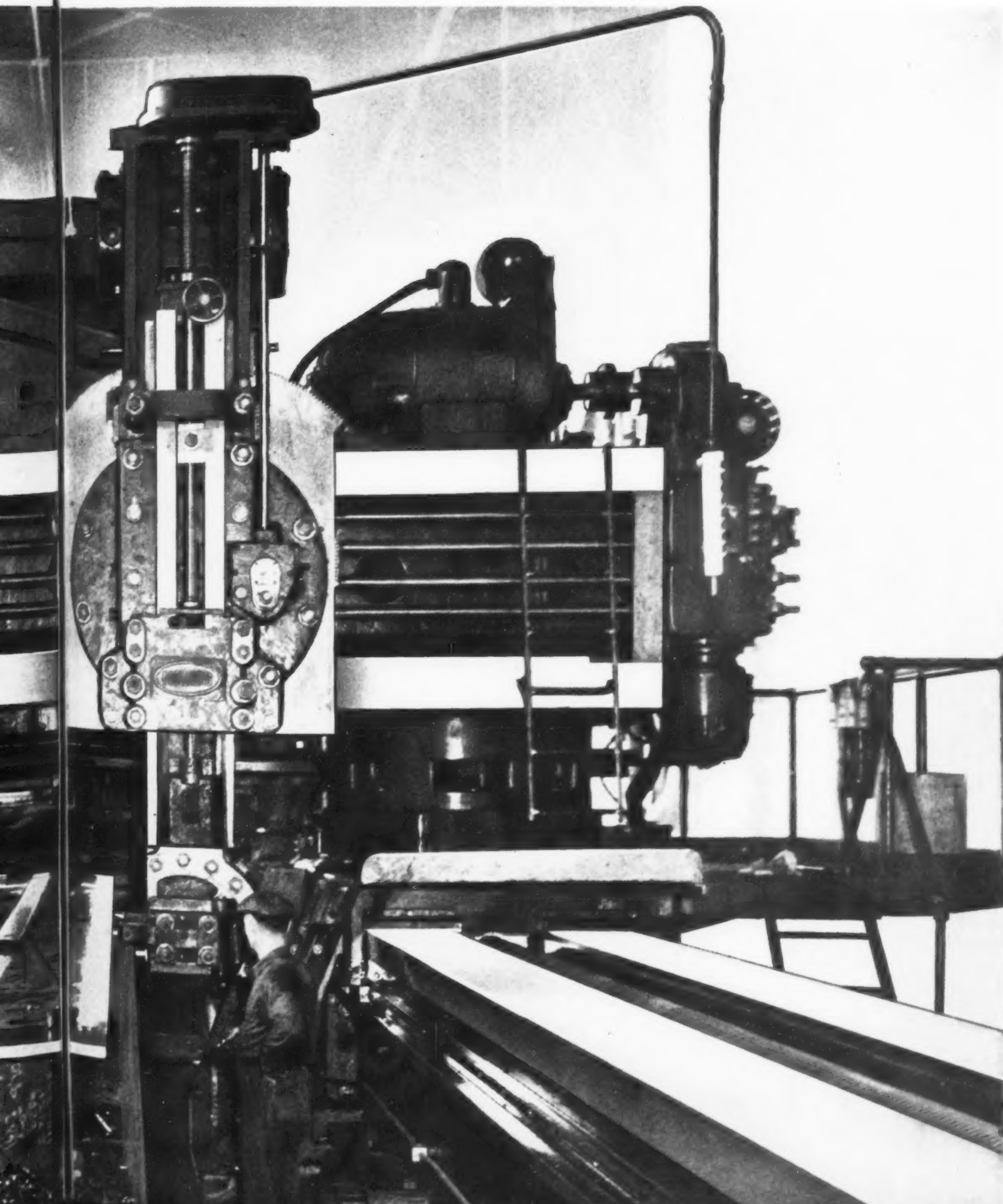


Fig. 1. Huge Armor-plate Planer of Radically New Design, Having a Stationary Table and a Moving Cross-rail Provided on One Side with Two Longitudinally Cutting Tool-heads and on the Opposite Side with a Transverse Cutting Tool-head

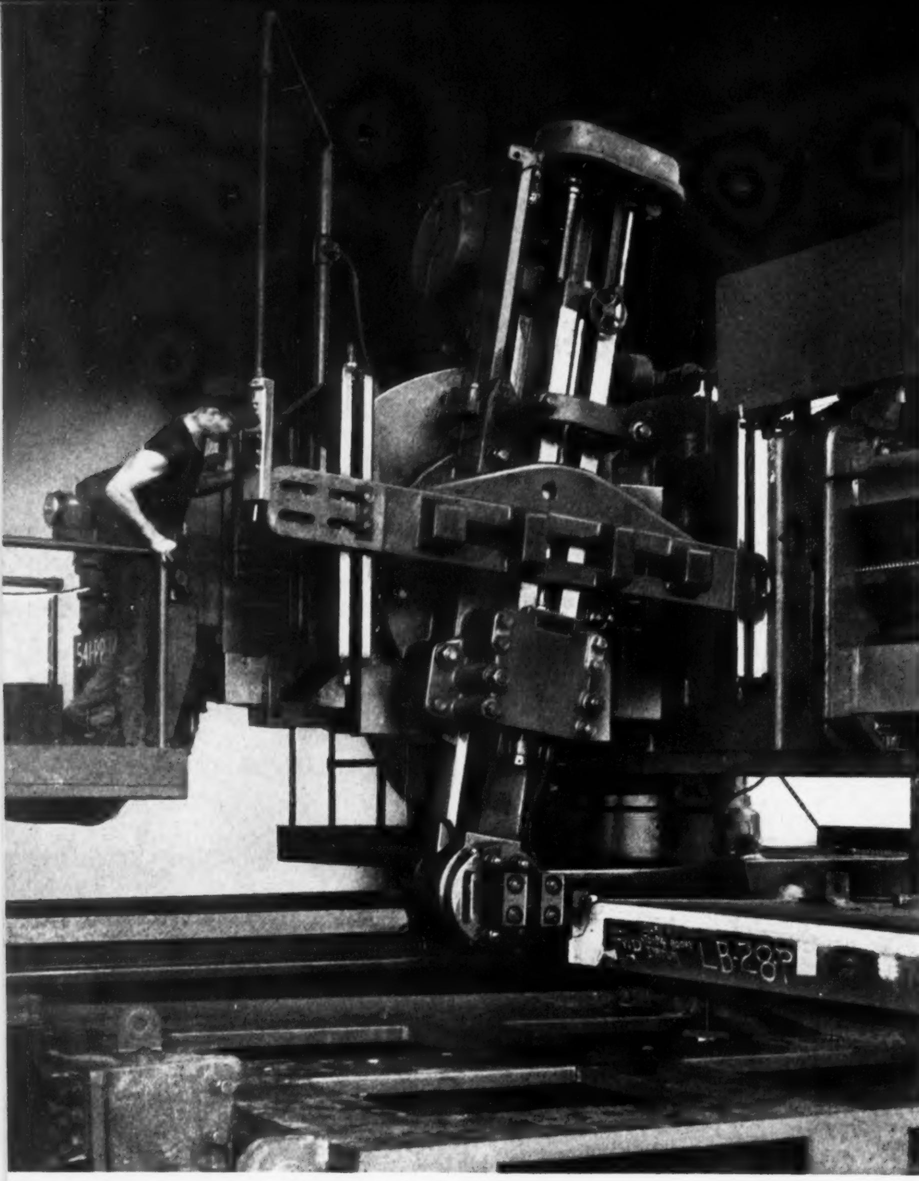


Fig. 2. (Left) Close-up View of Transverse Tool-head on the Armor-plate Planer Shown in Fig. 3, which is Engaged in Taking a Cut across the End of a Fairly Thick Armor-plate Section

Fig. 3. (Below) The Second of the Two Huge Armor-plate Planers, Showing the Side of the Cross-rail that Carries Transverse Cutting Tool-head

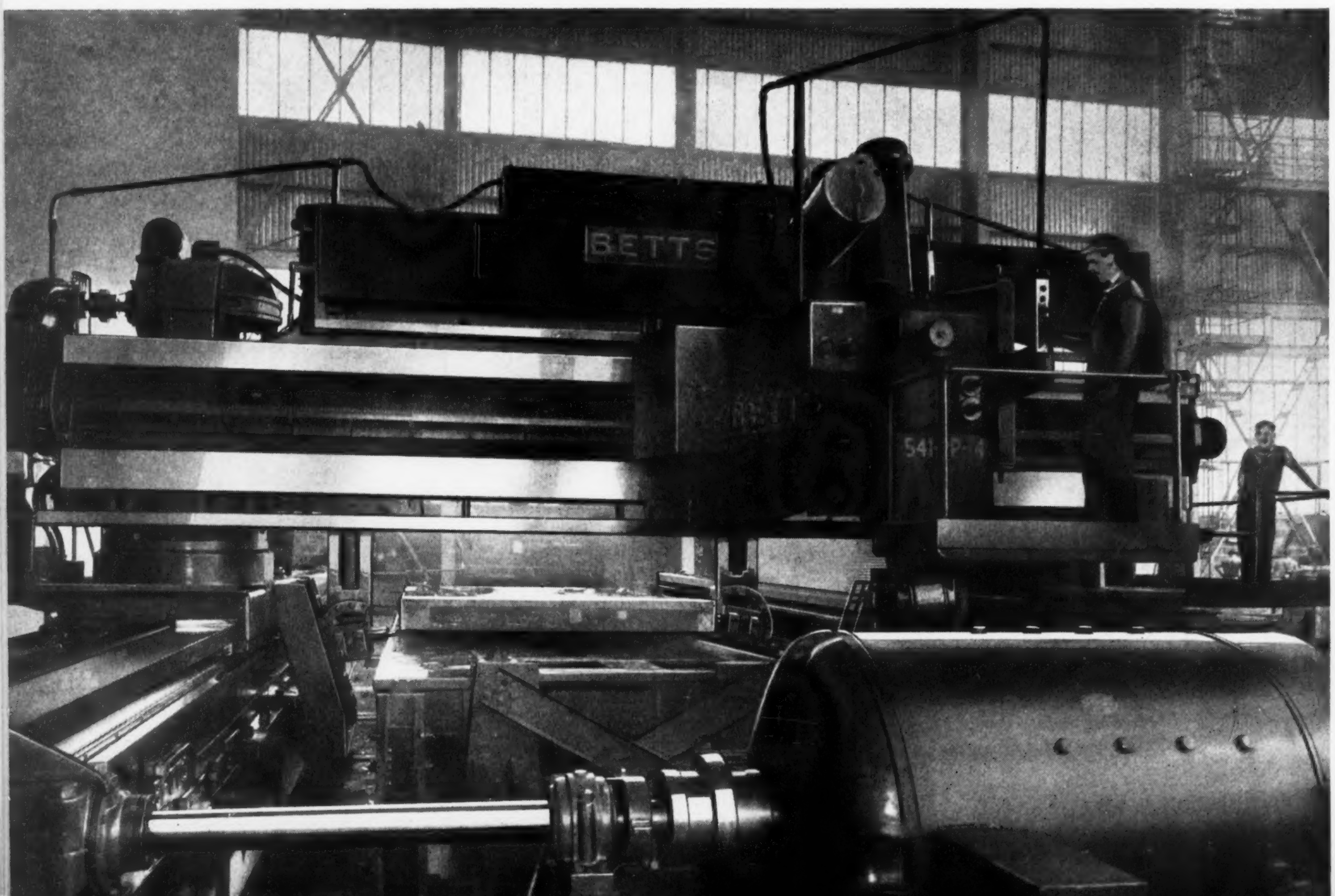


Fig. 4. (Right) The Double Carriage on Another Type of Plate Planer, Used in Machining One End of the Armor-plate Sections that Cannot be Accommodated by the Machine Seen in Fig. 1

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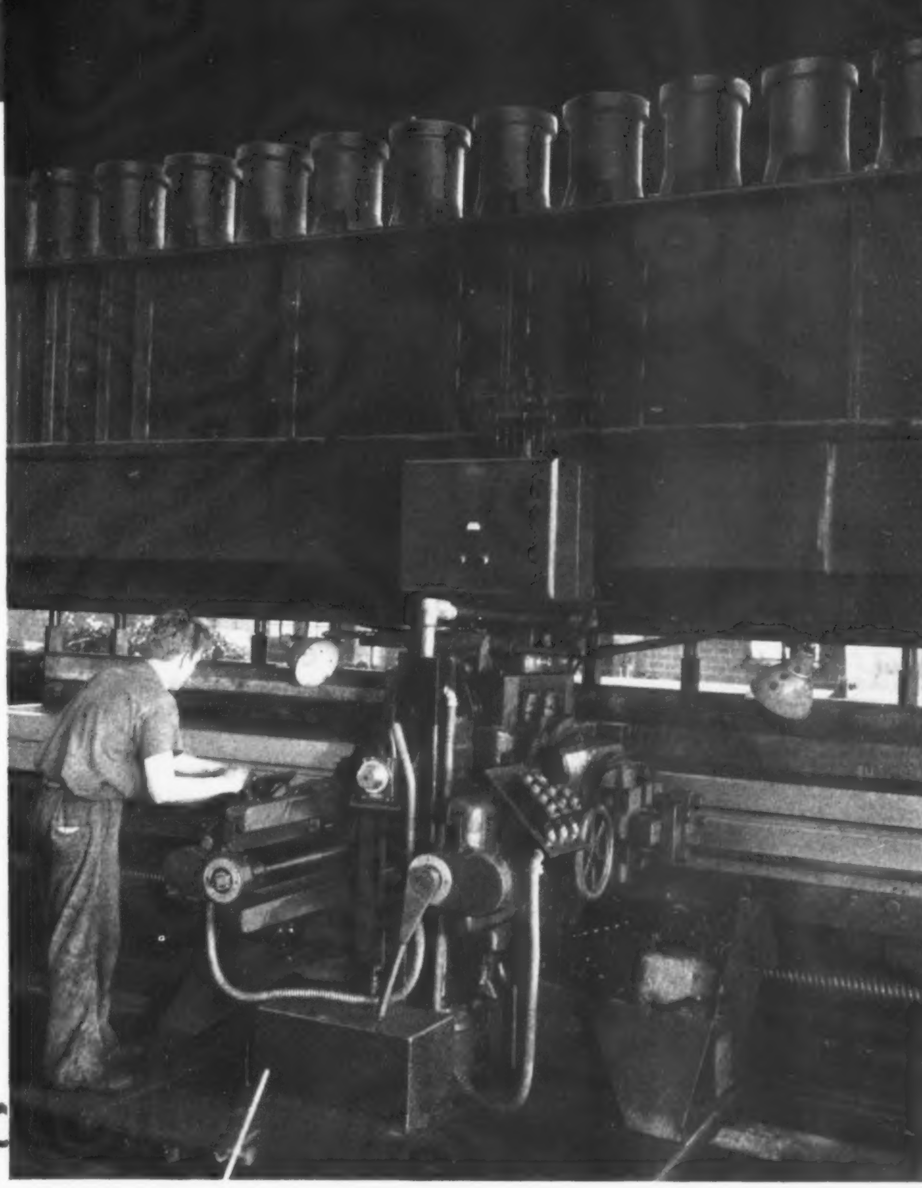
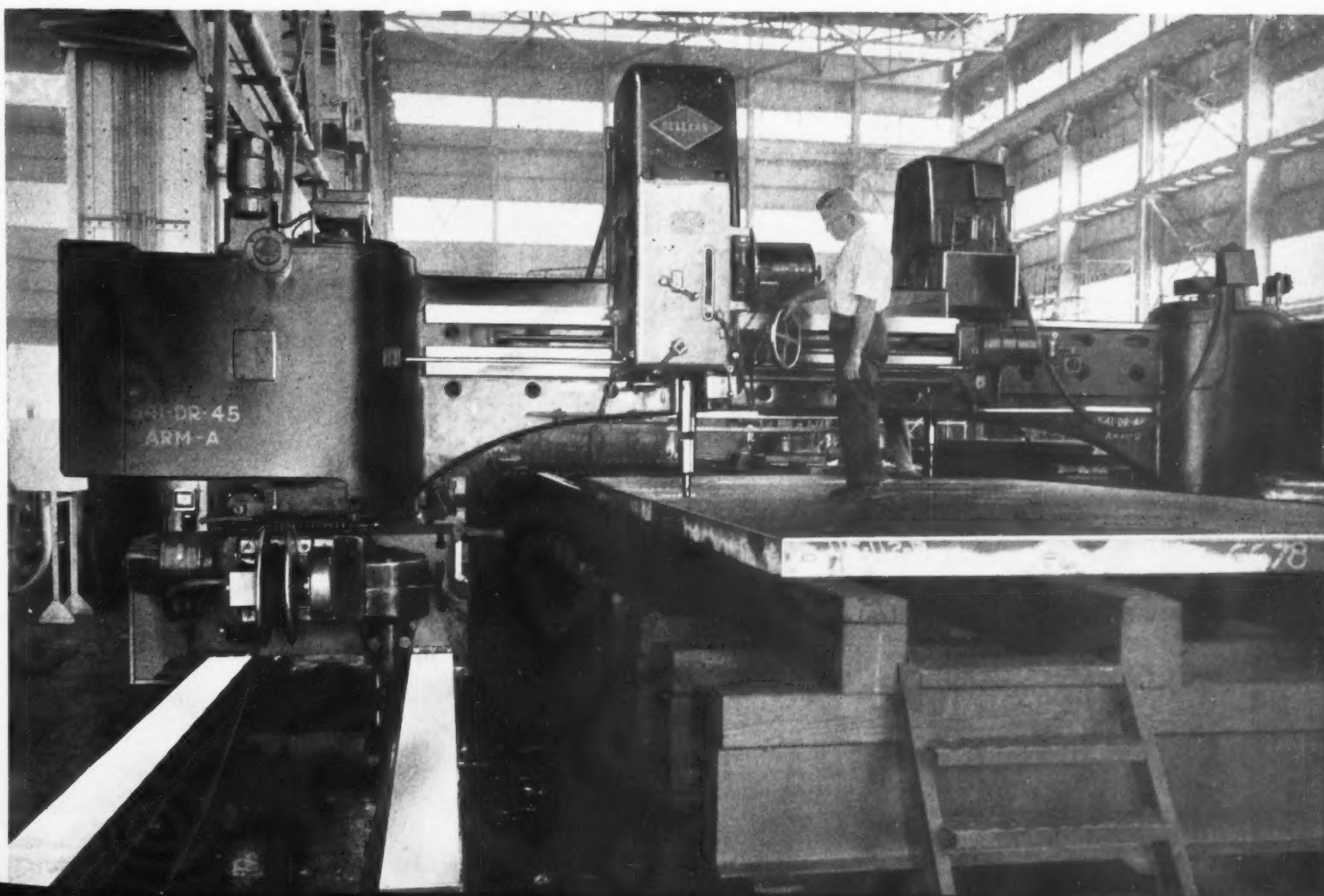
Fig. 5. (Below) Four Radial Drilling Machines, Arranged on Beds at Opposite Sides of a Huge Table, Facilitate Drilling Armor-plate Sections





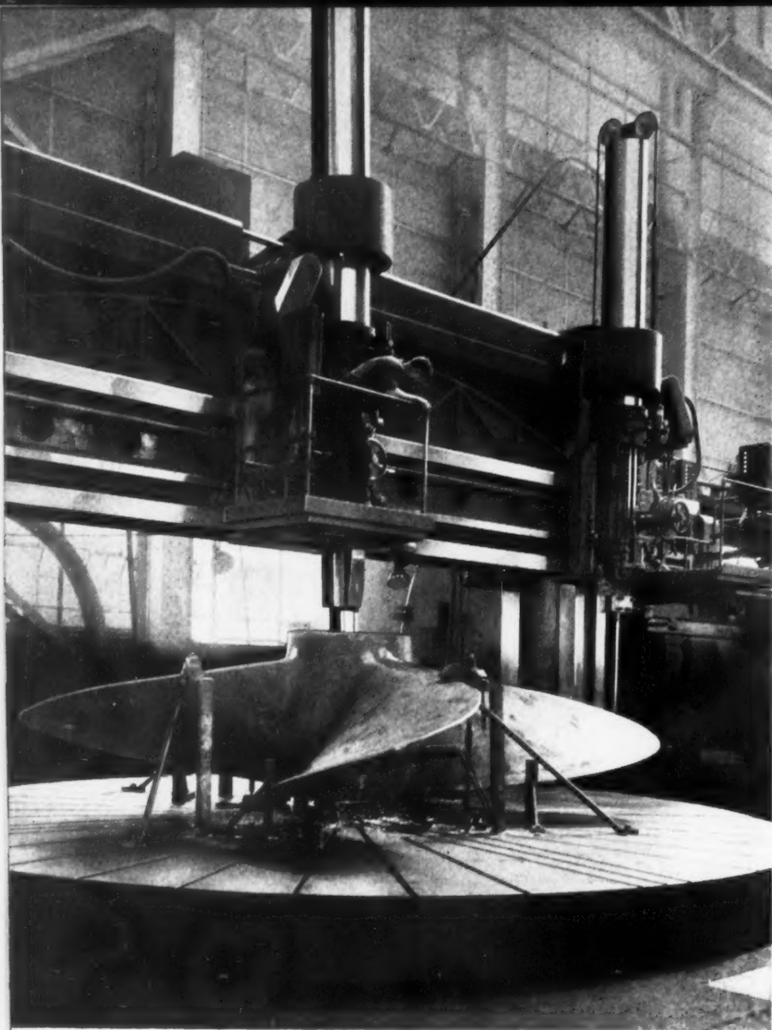


Fig. 6. Machining the Taper Bore in an 18-foot Propeller on a Large Vertical Boring Mill

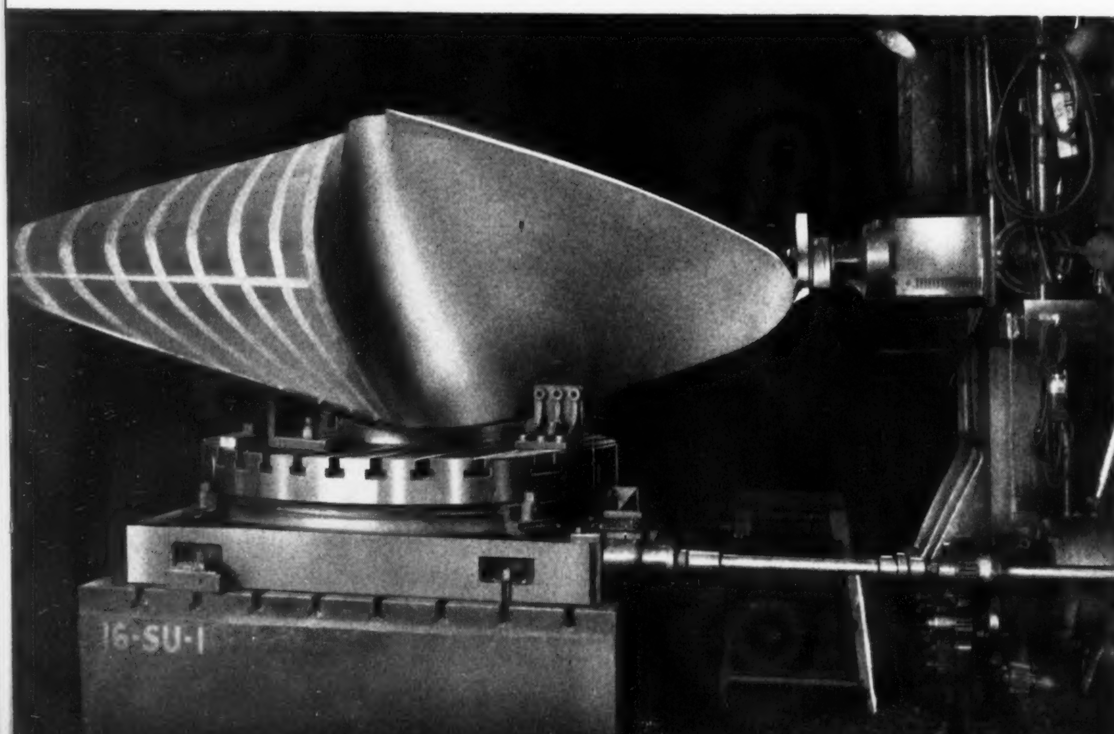
Fig. 7. Planing the Leading Side of a Large Constant-pitch Propeller on a Draw-cut Shaper

realize. Another important advantage is the removal of the danger of excessively straining and seriously damaging the expensive vessel while launching. Building docks can also be used for under-water repairs depending upon the needs of the time.

This article describes operations being performed on some of the machine tools that have been recently purchased to place the Philadelphia Navy Yard on its present high plane of shipbuilding efficiency. Two of the machine tools are of radically new design and are not duplicated elsewhere, except at the Brooklyn Navy Yard, where there is one machine of the same type. These machines are the huge armor plate planers seen in Figs. 1, 2, and 3. Although one of these machines was built by the Consolidated Machine Tool Corporation and the other by the Niles Tool Works, they are identical in construction, having been completely designed by the Consolidated Machine Tool Corporation and built from the same drawings, the Niles machine and the one in the Brooklyn Navy Yard under license from the Consolidated Machine Tool Corporation.

These planers are designed with a stationary table and a movable cross-rail that is equipped on one side with two tool-heads for taking longitudinal cuts in both directions of the cross-rail movement over the table. On the back of the cross-rail is a third tool-head, which is fed crosswise of the rail for taking transverse cuts both ways across one end of the armor plates. The transverse cuts are taken with the cross-rail locked in one position on the two beds that extend along both sides of the table.

The cross-rail is 30 feet long, and the beds on which the cross-rail carriages ride are 60 feet long. Lead-screws 7 1/2 inches in diameter



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operate the carriages on which the cross-rail is mounted. These lead-screws revolve in a bath of circulated filtered oil. If for any reason the oil-pump that supplies the lead-screw troughs should fail to function, it would immediately become impossible to operate the planer.

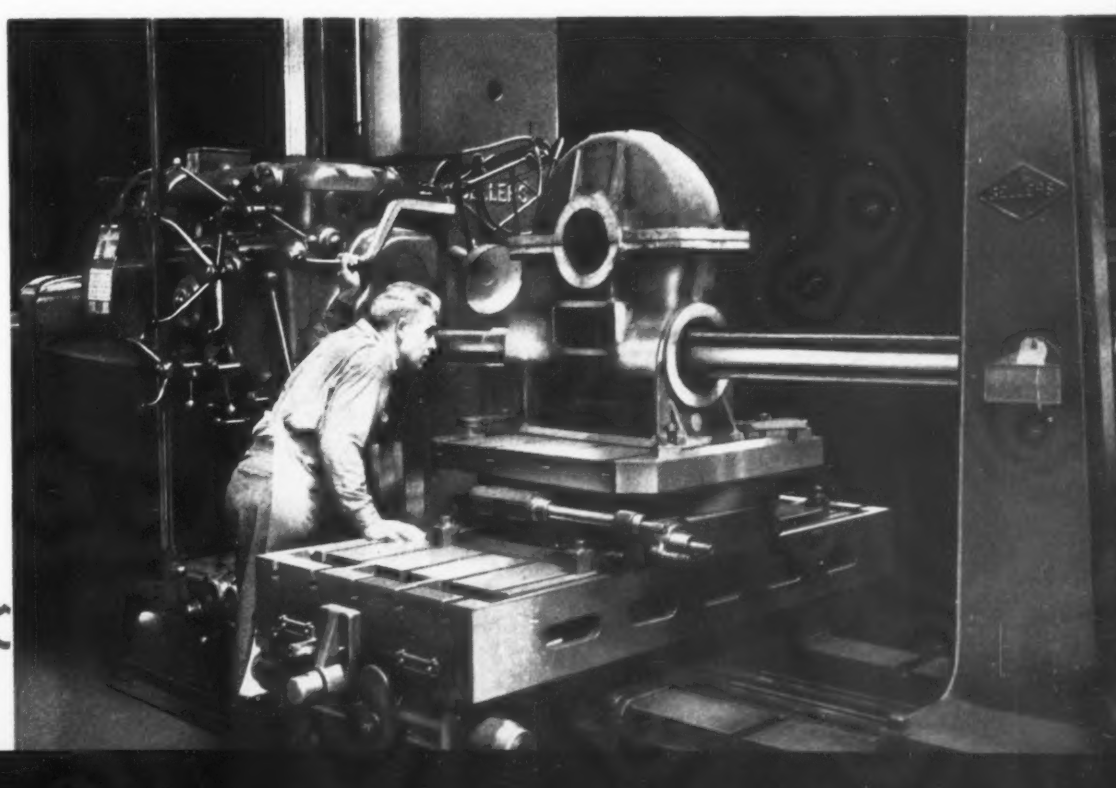
The table of these planers is pivoted in the middle on a horizontal axis and can be tilted up and down to the required angles by the operation of four hydraulic jacks, two of which are provided at each end of the table. With this construction, the plates can be planed on one side to various angles with respect to the other side of the plates. This is merely done by machining one side to one angle for a specified length, then tilting the table to suit the angle of the next surface and proceeding as before. In this way, all angular surfaces on both sides of armor plates can be placed parallel with the path of the tool movements.

The practice is to plane the armor-plate sections on both the top and bottom of the two sides and ends to a width of approximately 4 inches, and also on the edges of the sides and the ends. All cuts are taken with one set-up of the work, which effects a tremendous saving in time over the previous method, in which the work had to be shifted each time that a surface was to be machined to a different angle. The tool-heads are generally controlled by operators riding on platforms attached to the ends of the cross-rail and to the transverse cutting tool-head.

From Fig. 1, which shows one side of the cross-rail on the Niles planer, it will be seen that the tool-heads used for longitudinal cuts are of a swiveling design, so that they can be tilted sideways to the required angles. In addition, the tool-blocks on the lower end of the

Fig. 8. Cutting a Keyway in the Tapered Bore of a Patrol-boat Propeller by Employing a Hydraulic Slotting Machine

Fig. 9. Boring Operation on a Worm-gear Housing which Calls for an Unusually High Degree of Accuracy



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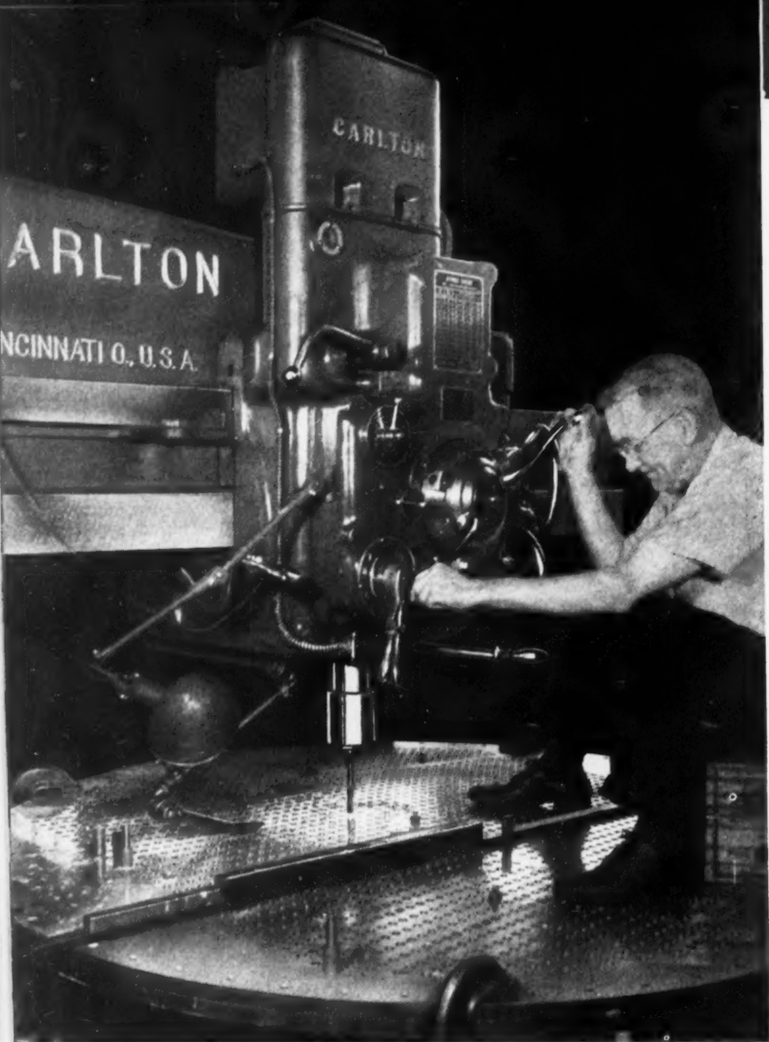

Fig. 10. Two Thousand Holes, More or Less, Must be Drilled and Reamed in Auxiliary Condenser Tube Sheets; One Drilled Sheet is Used as a Jig for Others in the Same Lot

★

rams can be tilted to facilitate various settings of the cutting tools. For operations in which it is necessary to feed the transverse cutting tool-head at an angle relative to the end of the table, the cross-rail can be adjusted to the required angle by locking one carriage to its bed and then traversing the opposite carriage along its bed until the desired setting has been obtained. This is accomplished by disconnecting either a coupling or a clutch in the drive from the main motor to the lead-screw of the cross-rail carriage that is to remain stationary.

Fig. 3 shows a view of the cross-rail on the Betts planer (built by the Consolidated Machine Tool Corporation), taken from the side of the transverse tool-head, and Fig. 2 shows a close-up view of that tool-head.

Motors on the ends of the cross-rail feed the tool-heads crosswise, as well as up and down. The cross-rail traverse screws are driven by a 150-H.P. motor at one end of the machine, which transmits power through clutches, couplings, and reduction gear units to the lead-screws of the cross-rail carriages.

These two plate planers represent an investment of about $300,000 apiece. Adjacent to them a huge Southwark 3000-ton hydraulic press has been installed for straightening and forming operations on plates and shapes.

Plate sections that are not machined on either of the big planers just described are finished on planers of the type illustrated in Fig. 4. The particular machine shown in this illustration was built by the Baldwin-Southwark Division of the Baldwin Locomotive Works. Cross-slides are provided on both sides of the carriage, which travels the length of the machine, so that roughing cuts can be taken as it feeds from

Fig. 11. Employing a Horizontal Boring, Drilling, and Milling Machine for Finishing Bearings in a Worm-gear Housing within Unusually Close Tolerances

right to left and also as it returns from left to right. In taking finishing cuts, however, a cut is taken in one direction only. Roughing cuts are taken to a depth of 1/8 inch and a width of 1 inch at a speed of 25 feet a minute.

The work is clamped firmly to the table by means of twenty-four overhead pneumatic cylinders, twelve of which can be seen in the illustration. This planer accommodates plate sections up to 46 feet long between the housings. A 6-inch lead-screw actuates the carriage. The tools used on this plate planer, as well as on the large pit planers previously described, are of tungsten-cobalt tool steel.

The large armor-plate sections are quickly drilled by means of four Sellers radial drilling machines, which are arranged two each on long beds on opposite sides of a large table, as illustrated in Fig. 5. The table is built up of structural steel and heavy wood planks. The radial drilling units are mounted on separate carriages that are moved along the beds by a rack and pinion drive for approximate positioning along the work. Then the radial arms are swung about on their columns, and the drill head fed along the arms in the customary manner for close location of the drill spindles over the punch-prick marks that indicate where the holes are to be drilled.

In the particular set-up illustrated, holes 1 1/2 inches in diameter are being drilled through the armor plate, but holes as large as 3 inches in diameter are produced with this equipment. After being drilled, the holes are countersunk with the same machines.

The boring of propellers calls for a particularly high grade of workmanship, because of the fact that the diameters of the taper bore

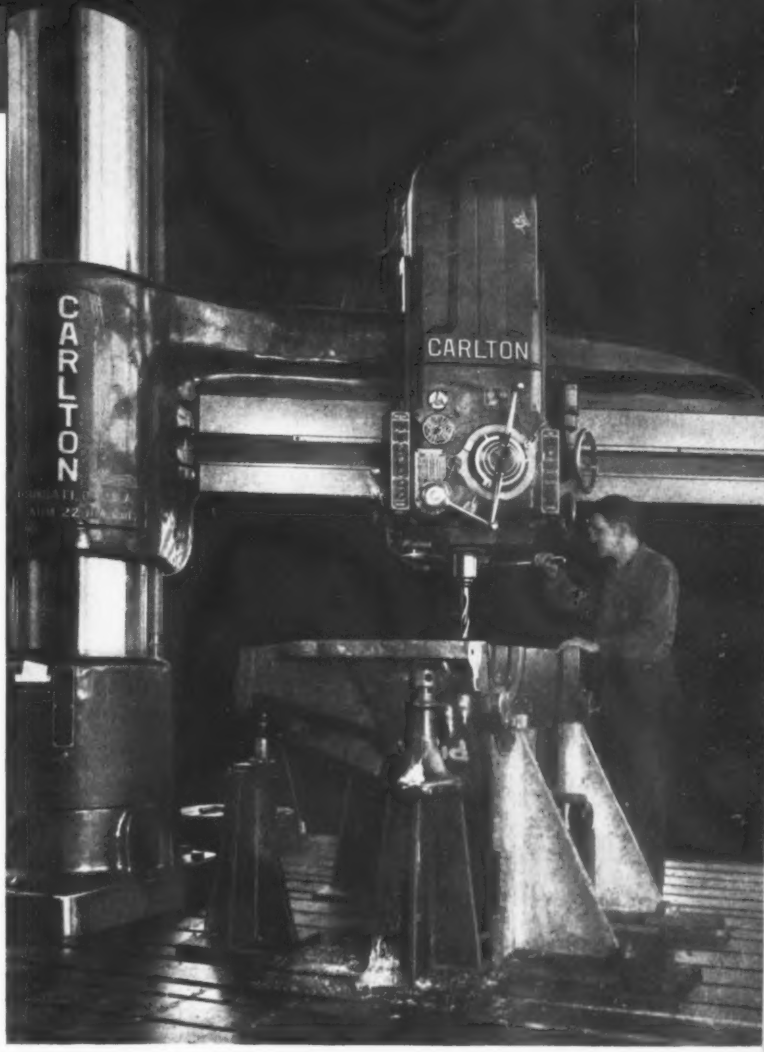

Fig. 12. Another Typical Operation on a Radial Drilling Machine, which Consists of Drilling Bolt-holes in a High-pressure Turbine Casing

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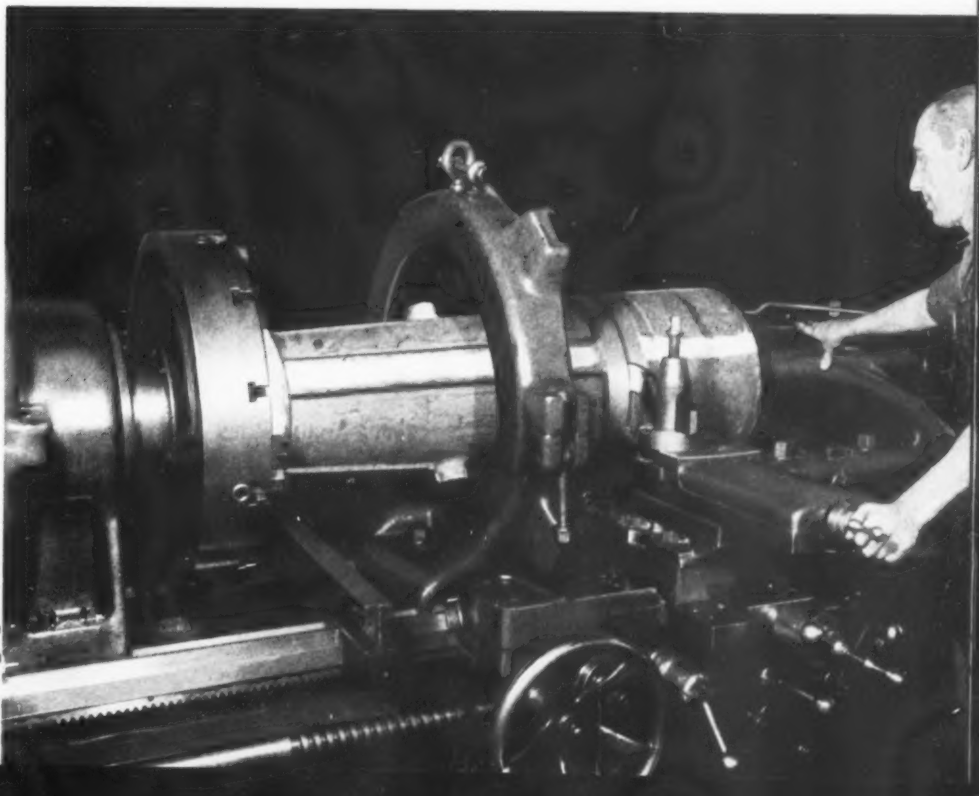


Fig. 13. Using an Engine Lathe for Cutting off the Riser on an Iron Casting that will Serve as a Gage for the Tapered Section of Propeller Shafts

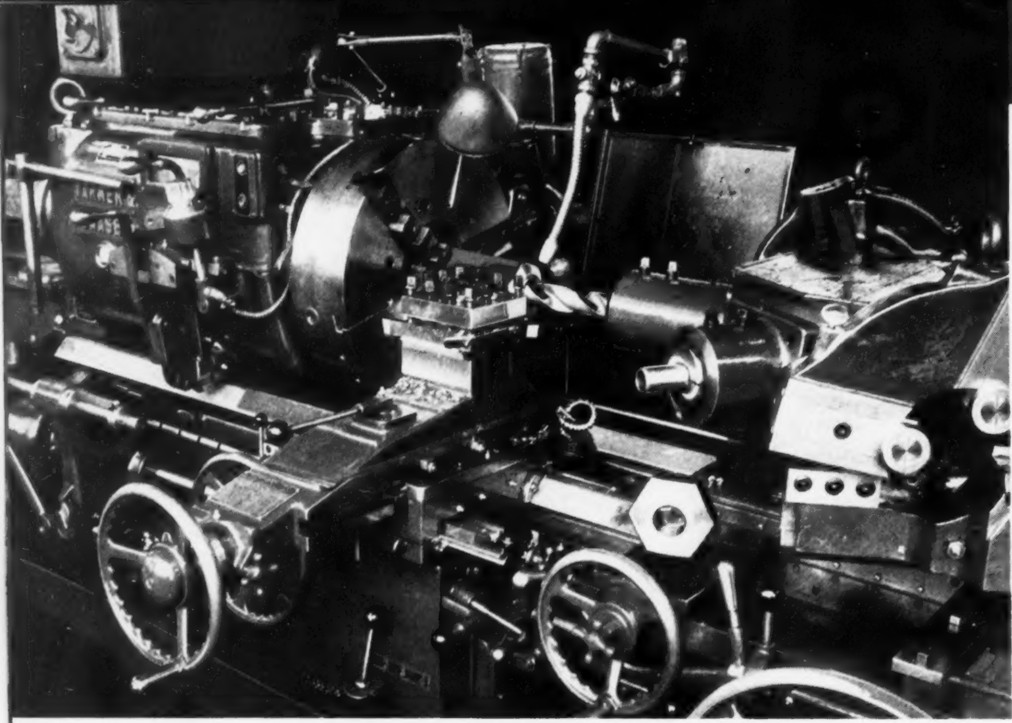


Fig. 14. (Left) Turret Lathe Tooled up for Producing Nuts for 2 3/4-inch Bolts from 4 3/4-inch Hexagonal Bars of Nickel Steel

Fig. 15. (Below) Turning a Propeller Shaft for a Battleship in a Lathe that Accommodates Work up to 55 Feet Long

must be finished true to within 0.0015 inch, and also the exact position of the propeller on its shaft must be closely obtained. Both the propeller bore and the tapered section of the shaft on which the propeller fits must meet the requirements of "Go" and "No Go" gages.

The boring operation on the propellers is performed on the Betts 25-foot vertical boring mill illustrated in Fig. 6. The propeller shown is 18 feet in diameter and has a hub about 50 inches long. At the beginning of this operation, it was necessary to cut off a riser 46 inches in diameter by 4 feet high from the top end of the hub, after which the hub was accurately faced and the boring operation started. Taper boring is readily accomplished by merely swiveling the boring-bar to the required angle.

Constant-pitch propellers are machined on their front or leading side by the large Morton draw-cut shaper illustrated in Fig. 7. The operation illustrated is being performed on a propeller for a destroyer. The propeller is mounted on a circular table which is geared up with the mechanism that feeds the ram, so that with each

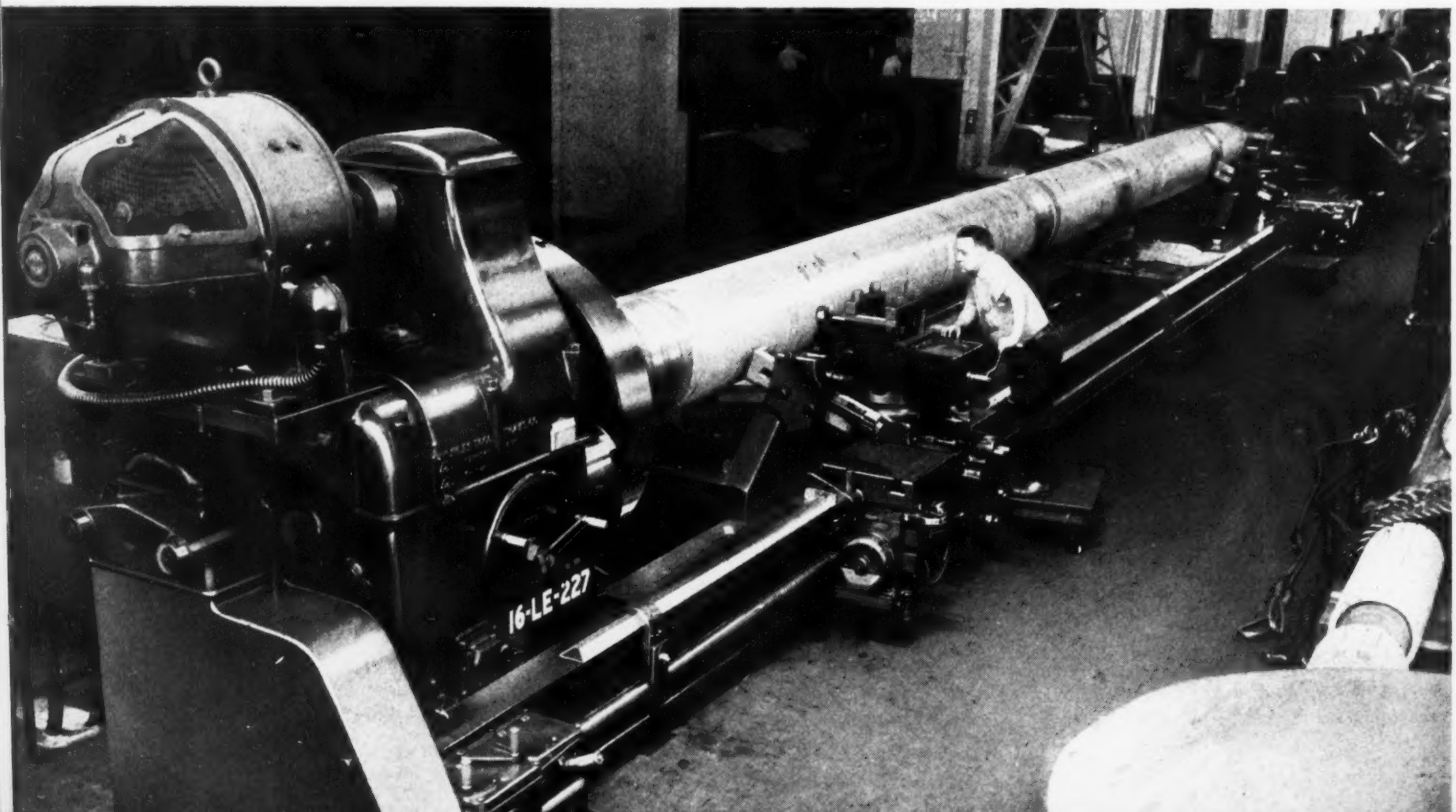
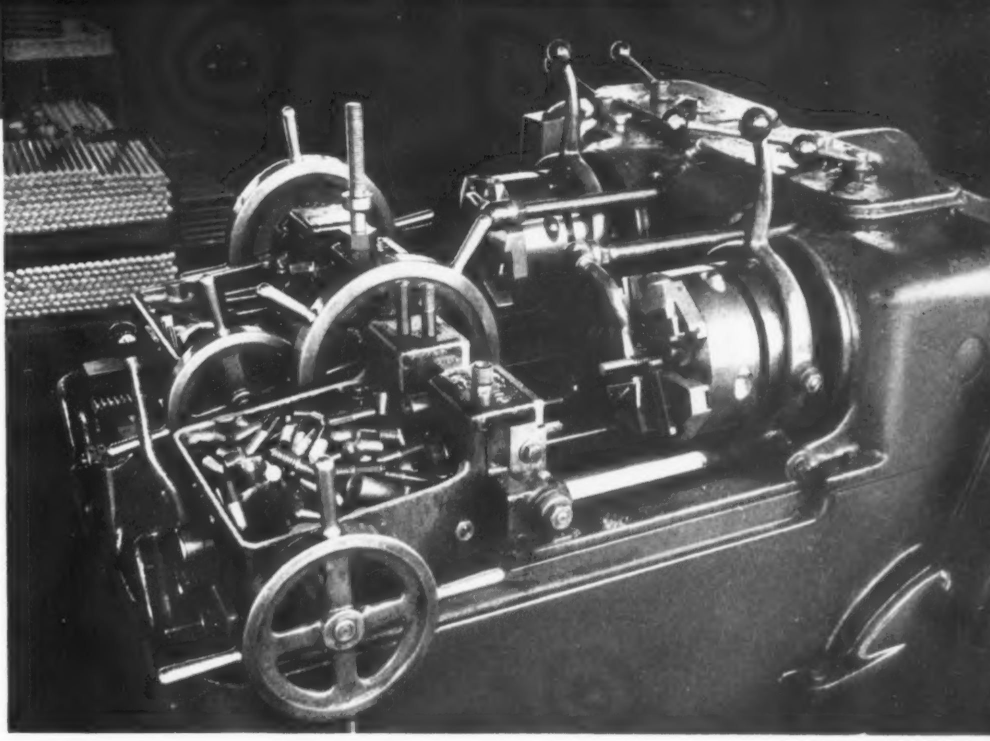


Fig. 16. (Right) Double-head Threading Machine that Handles a Variety of Work, as Shown by the Examples on the Work Vises

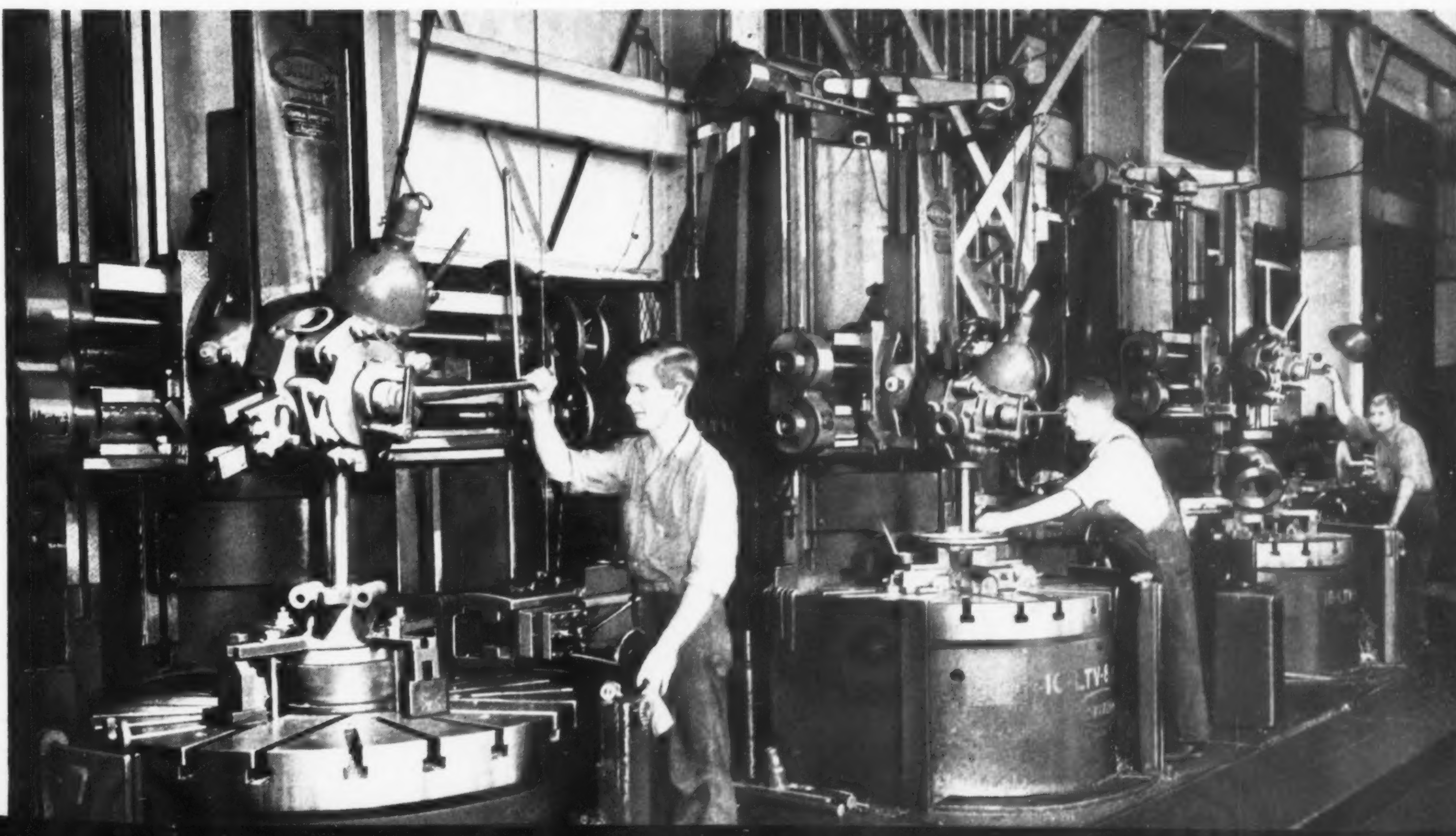
Fig. 17. (Below) Battery of Vertical Turret Lathes Used for Finishing Castings for Valves and Similar Parts



upward feed movement of the ram the table revolves a proportionate amount toward the path of the tool. This synchronizing mechanism was developed by the Navy Yard employes and applied to a standard machine. In planing a propeller, the practice is to take roughing cuts successively on all three blades instead of finishing one blade before starting the next.

Two Rockford hydraulic slotters have recently been installed for a wide variety of work. Fig. 8 shows one of these machines being used for cutting a keyway in a propeller for a small patrol boat. The machine is especially adapted to this type of work because the tool ram can be tilted forward to suit the taper bore in the propeller, whereas the set-up presented some difficulty when such an operation had to be performed with the equipment previously available. Cutting speeds from 0 to 80 feet a minute are obtainable with this machine, and return speeds from 0 to 150 feet a minute.

Horizontal boring, drilling, and milling machines are prominent in shipyard machine shops because of their suitability for handling the



large castings that are required in considerable quantities on ships. In Fig. 11 a Giddings & Lewis portable machine of this type is engaged in boring the end bearings of a worm-gear housing to receive roller bearings. The blueprints specify that these bores must be machined as close to the given dimensions as it is possible to bore, no tolerances being given on the prints. In addition to boring, the machine face-mills the ends of the bearings. Being portable, this machine can be readily conveyed to any part of the shop and positioned beside the heavy castings for boring, drilling, or milling operations, in which case the table seen in the illustration would not be required.

The same type of operation is being performed by the Sellers horizontal boring, drilling, and milling machine shown in Fig. 9 on a somewhat larger worm-gear housing. When the bearings being machined are finished, the castings are turned 180 degrees on the table to permit similar machining of the upper bearings.

About two thousand holes must be drilled and reamed through auxiliary condenser tube sheets such as shown in Fig. 10, these operations being performed on radial drilling machines. The practice is to accurately lay out one of these sheets, and after drilling, use this sheet as a jig in drilling the remaining sheets. The reamed holes must be to the specified size within plus 0.003 inch, minus nothing. The Carlton radial drilling machine used has a 6-foot arm.

Another radial drilling machine of the same make is shown in Fig. 12 being used for drilling one section of a high-pressure turbine casing. Bolt-holes are being drilled in the flange of the casting to provide a means of attaching the second half. Holes 1 1/8 inches in diameter are being drilled, but in some work of this kind the holes run up to 3 inches in diameter. In producing the larger holes, a drill 1 or 1 1/4 inches in diameter would be used to start them. Some of the bolt-holes are reamed on the same machines.

This radial drilling machine is provided with an 8-foot arm and an unusually large floor plate, which enables other work to be set up ready for drilling while an operation is in progress on another casting. The bedplate measures 12 by 14 feet.

Propeller shafts are machined in the Niles engine lathe shown in Fig. 15, which has a swing of 64 inches and accommodates lengths up to 55 feet between centers. The operation shown consists of turning a shaft for a battleship, the weight of the shaft being approximately 24 tons, although some propeller shafts weigh as much as 33 tons. The shaft is hollow, having a hole of about 14 inches in diameter extending the full length. Some of the surfaces must be machined to close tolerances, as, for example, the tapered section to which the propeller is fitted, the diameters of which must be true within a tolerance of 0.0015 inch. The lathe is provided with two carriages, both of which are generally in use, so that one end of the long shaft can be turned while cuts are being taken on the opposite end.

The type of gage used in checking the tapered section of propeller shafts will be apparent from Fig. 13, in which the main casting for such a gage is being machined in an American engine lathe. At the time that the photograph was taken, the operator was engaged in cutting off the riser from one end of the casting. After

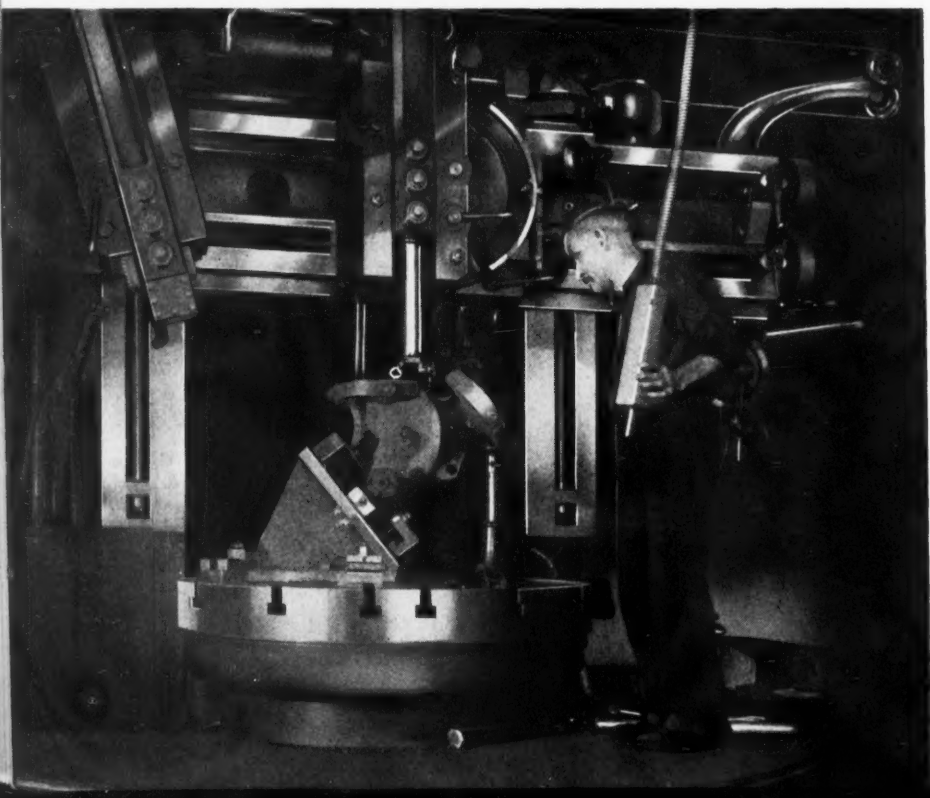


Fig. 18. Vertical Boring Mill of 48 Inches Swing being Set up for Boring, Facing, and Grinding Operations on an Angle Valve

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that is accomplished, the casting is transferred to another machine for boring the gaging surfaces to the required angle and diameters within the extremely close tolerances necessary.

A battery of Bullard vertical turret lathes engaged in boring, facing, and turning valve parts of chromium-molybdenum steel is shown in Fig. 17. These machines are all of 54 inches swing. They are especially suited to the "jobbing shop" nature of the work in a shipyard machine shop, because the tools on the turrets and side-heads can be quickly applied in a high production manner where one part of a given kind or a sizable lot of duplicate parts is going through the shop.

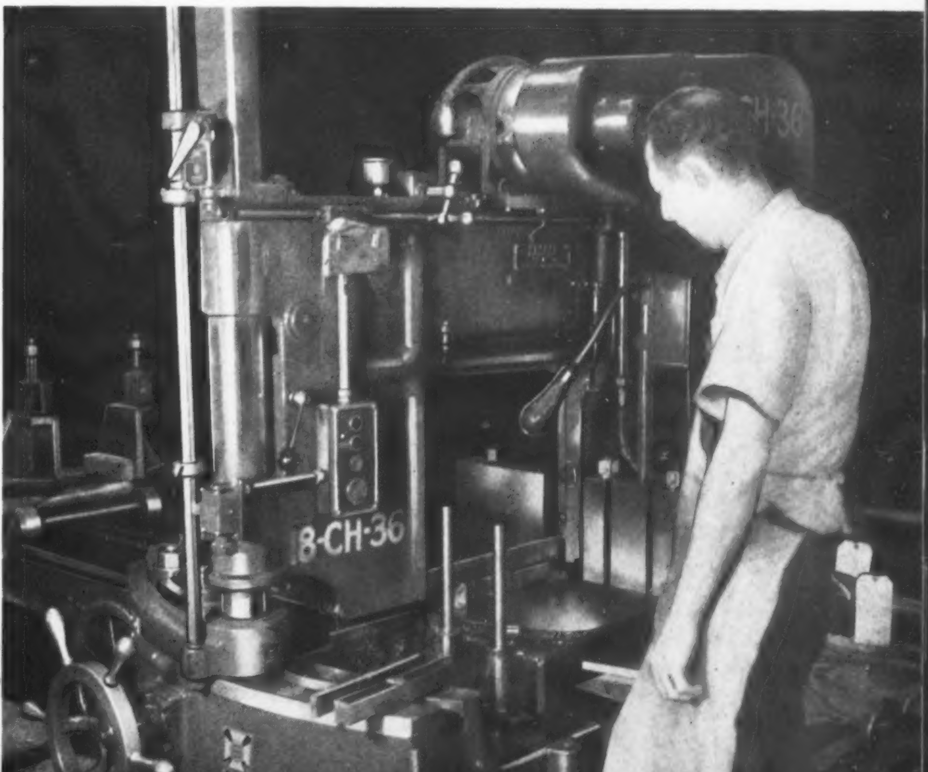
Valve parts and similar work are also handled by King vertical boring mills, a typical operation being shown in Fig. 18 on a machine of that type which has a swing of 48 inches. Valve bodies are bored and faced on this machine, and then the Stellite seats are finished by means of a grinding attachment mounted on the machine spindle. In the set-up shown, an angle-plate on the table facilitates locating the flange being machined parallel with the top of the table. At the time that the photograph was taken, an indicator on the end of the tool-spindle was being used to set up the work.

Hexagonal bar stock 4 3/4 inches in diameter across the flats is handled by the Warner & Swasey turret lathe shown in Fig. 14 in producing nuts of the type seen at the front of the hexagon turret carriage. The bar stock is of nickel steel, and the nuts are made to a nominal thread diameter of 2 3/4 inches. In the operation, the end of the bar is first drilled to a diameter of 2 1/8 inches by a drill mounted on one of the hexagon turret stations, this step of the operation being in progress in the illustration. Then the single-cutter turner seen at the extreme right is advanced for forming the rounded head of the nut. Next a tap on the hexagon turret is employed for cutting the threads. Finally, a tool on the square turret of the cross-slide is fed toward the center of the turret lathe for cutting the finished nut from the bar stock. The same machine is used for producing bolts that go with these nuts. The chuck is provided with electrically operated jaws, which are opened and closed by depressing buttons on the front of the headstock.

The double-head Landmaco threading machine shown in Fig. 16 is used for the production of a considerable variety of parts, including several examples seen resting on the two work vises. The machine is fitted with 1 1/2-inch Lanco die-heads, and in the operation shown, is being used for threading one end of the studs seen lying on the front carriage. The flexibility of this machine, which facilitates changing from job to job, is particularly advantageous in this shop where the type of work is changed as frequently as a dozen times a day.

Steel billets up to 18 inches square or any number of bars having a total cross-section within that area come within the capacity of the Armstrong-Blum hydraulically operated Marvel cutting machine shown in Fig. 19. Cuts can be taken at right angles to the work in the usual manner or the saw frame can be swung around its column at the back of the machine to enable angular cuts up to 45 degrees to be taken across the work. In the operation shown, a test piece of armor plate is being cut.

Fig. 19. Hydraulic Cutting-off Machine that can be Set for Making the Cuts Straight across or at Any Angle up to 45 Degrees



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Expanding Uncle Sam's

AMERICAN submarines are as formidable as any in the world. The newest types move through the water at relatively high speeds and have a wide cruising range. They are over 300 feet long and have a surface displacement of approximately 1450 tons.

Torpedoes fired from these undersea vessels carry a heavy charge of T.N.T. in the nose, travel at a speed in excess of 30 miles an hour, and hit their objectives with accuracy at distances up to several miles. One such torpedo can seriously damage a heavily armored battleship, and three torpedoes would be almost certain to sink it.

Approximately eighty submarines of this type have been ordered by the United States Navy, more than forty of them from the Electric Boat Co., Groton, Conn., famed builder of undersea craft, which has already produced over 160 submarines for our own and foreign governments. This concern has tripled its plant facilities with a view to turning out these submarines in record-breaking time. More than $4,000,000 has been expended recently in new buildings and manufacturing equipment. Typical operations in this important submarine shipyard are described in this article.

The major portion of the shipyard is devoted to steel fabrication, as the motive equipment of the submarines is supplied by outside sources. Hence, there is a large variety of plate-fabricating equipment, including shearing machines, press brakes, forming rolls, punching machines, and oxy-acetylene cutting apparatus.

The submarine sections are fabricated in large shops located in front of the shore end of the

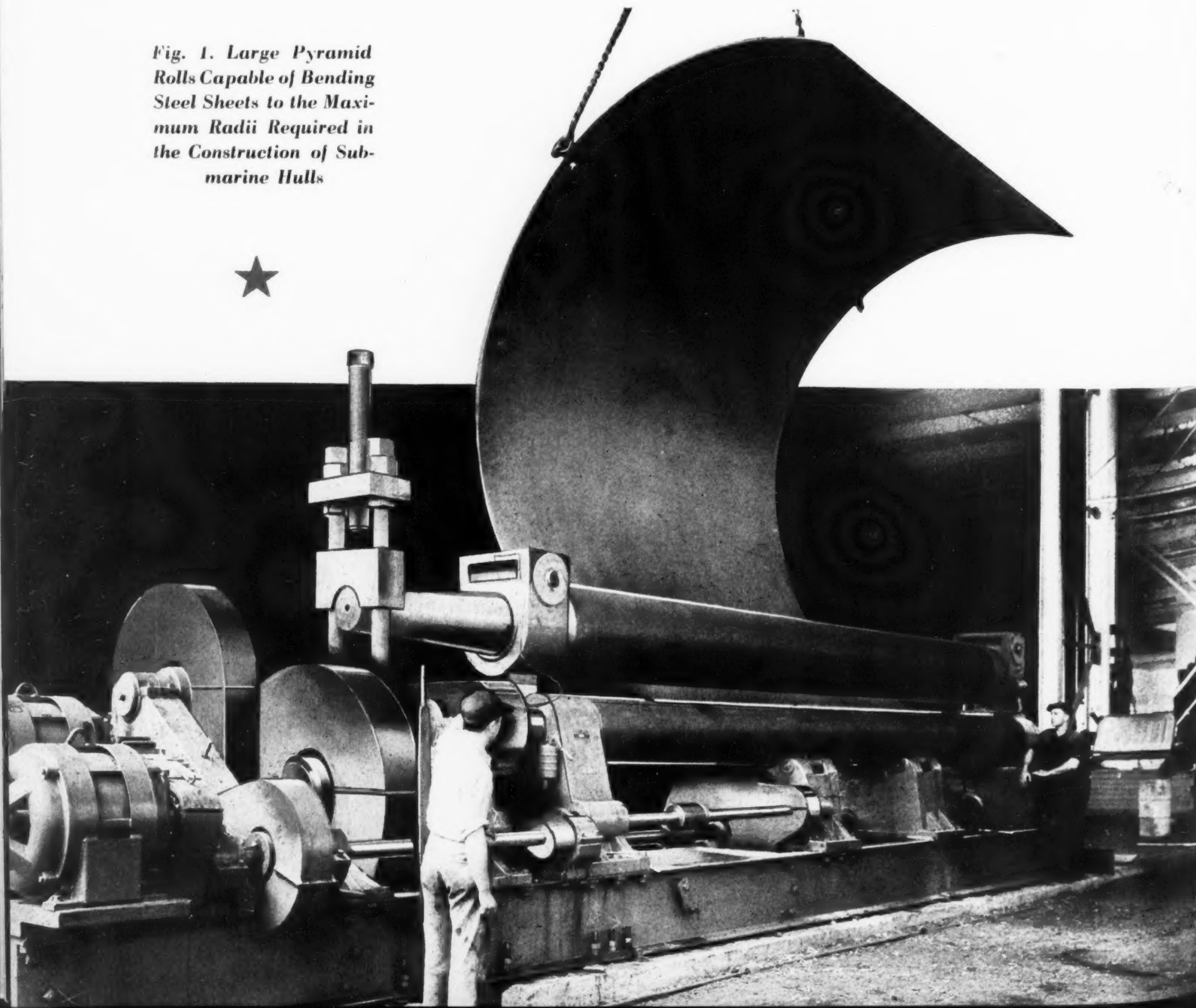
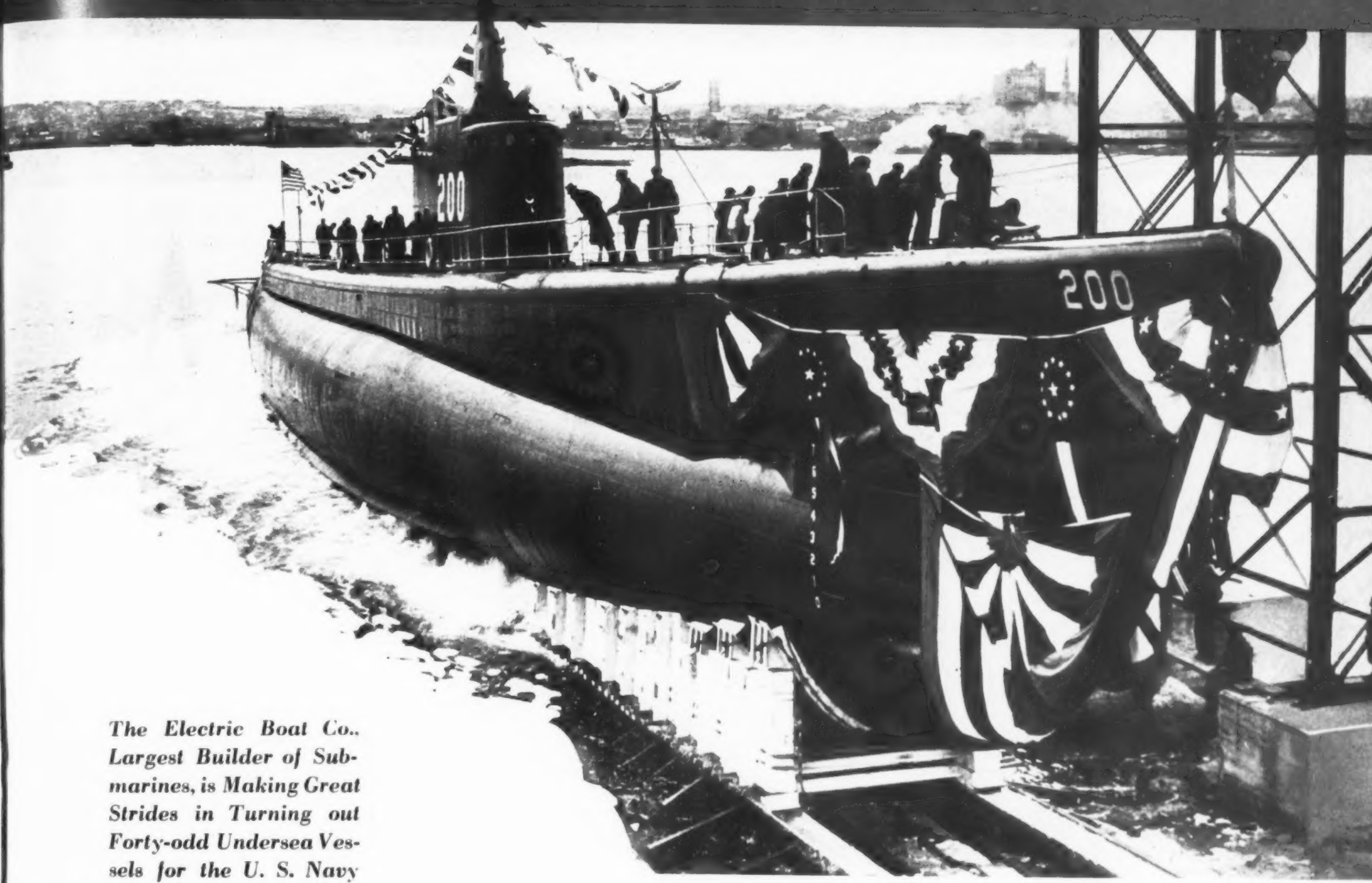


Fig. 1. Large Pyramid Rolls Capable of Bending Steel Sheets to the Maximum Radii Required in the Construction of Submarine Hulls

Undersea Fleet

By O. P. ROBINSON, General Manager
Electric Boat Co., Groton, Conn.



The Electric Boat Co., Largest Builder of Submarines, is Making Great Strides in Turning out Forty-odd Undersea Vessels for the U. S. Navy

ship ways and are carried by overhead cranes directly into position on the ways for assembly. Freight cars bring the steel sheets and shapes directly into one end of the fabricating shops, where this raw material is temporarily stored adjacent to the machines that prepare it for fabrication. Handling of material has thus been reduced to a minimum.

The huge Bertsch bending rolls shown in Fig. 1 have recently been installed in one of the fabricating shops. This machine is used for bending steel plates to the largest radius required in submarine hull construction. Plates up to 22 feet 2 inches wide and any required length can be handled. The machine is of the pyramid type, having one upper roll, 18 inches in diameter, and two bottom rolls in the same horizontal plane, approximately 16 inches in diameter. The top roll can be swung up at the right-hand end for removing the formed sheets. This is accomplished by a hydraulic jack mechanism. The weight of the machine is approximately 120 tons.

The Baldwin-Southwark plate planer illustrated in Fig. 2 has recently been installed for machining the edges of steel plates up to 2 inches thick and also the edges of structural shapes. In the illustration, the machine is shown planing the four edges of 12-inch I-beams, one edge at a time. The flanges are 5 inches wide as rolled, and are cut down to a width of 4 inches. Plates or shapes to be machined are securely clamped to the machine table by means of twenty overhead air jacks. These jacks can be applied in series of four each. Work up to 30 feet long can be accommodated.

Large steel plates are quickly cut out to the required outlines by the use of oxy-acetylene equipment, such as the Airco Radiagraph machine shown in Fig. 3. Lines scribed on steel plates of the thicknesses handled in this shipyard can be followed by this machine at speeds

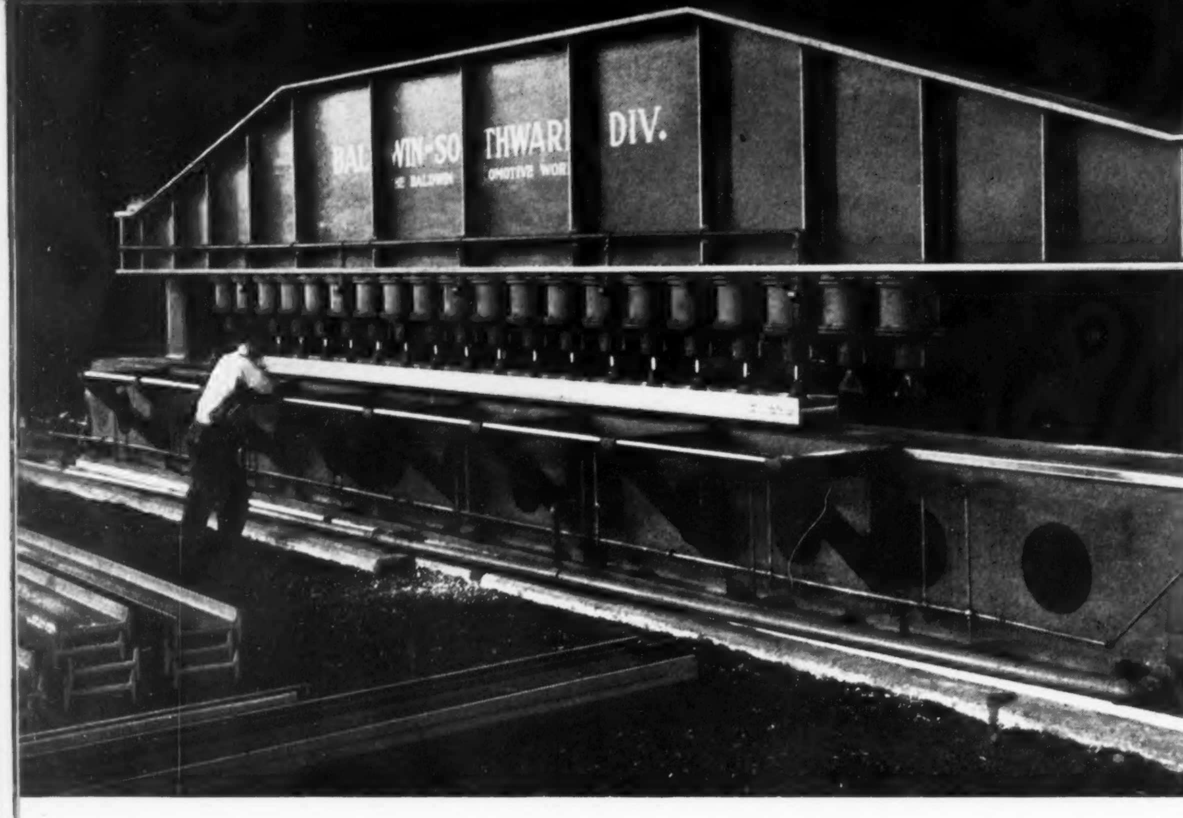


Fig. 2. (Left) Large Plate Planer Used for Machining the Edges of Steel Plates and Structural Shapes

Fig. 3. (Below) Large Plates are Cut out to Straight Lines and Curves by This Oxy-acetylene Machine

up to 32 inches a minute. In the illustration, the machine is shown traveling automatically along a track that is used in cutting in a straight direction. Curves of any desired radius can be conveniently followed by attaching the machine to a radius-rod that is pivoted on the small table extension seen at the left supported on two pieces of tubing.

Smaller pieces of steel plate are cut to irregular outlines, as many as four at a time, by Airco-DB Oxygraph machines, provided, as shown in Fig. 4, with a large table on which the work is placed at the left and templets at the right. Planograph arms move the oxy-acetylene cutting torches in the desired paths over the work as a magnetic tracer automatically follows the irregular contour of a cut-out steel templet. A manually operated tracer is also provided for use with scribed and drawn templets. The cutting torches are mounted on a square bar, about 12 feet long, on which they can be adjusted to the required center-to-center distances.

Fig. 4. (Right) Oxy-acetylene Equipment Used for Cutting out Four Irregular Shaped Pieces Simultaneously

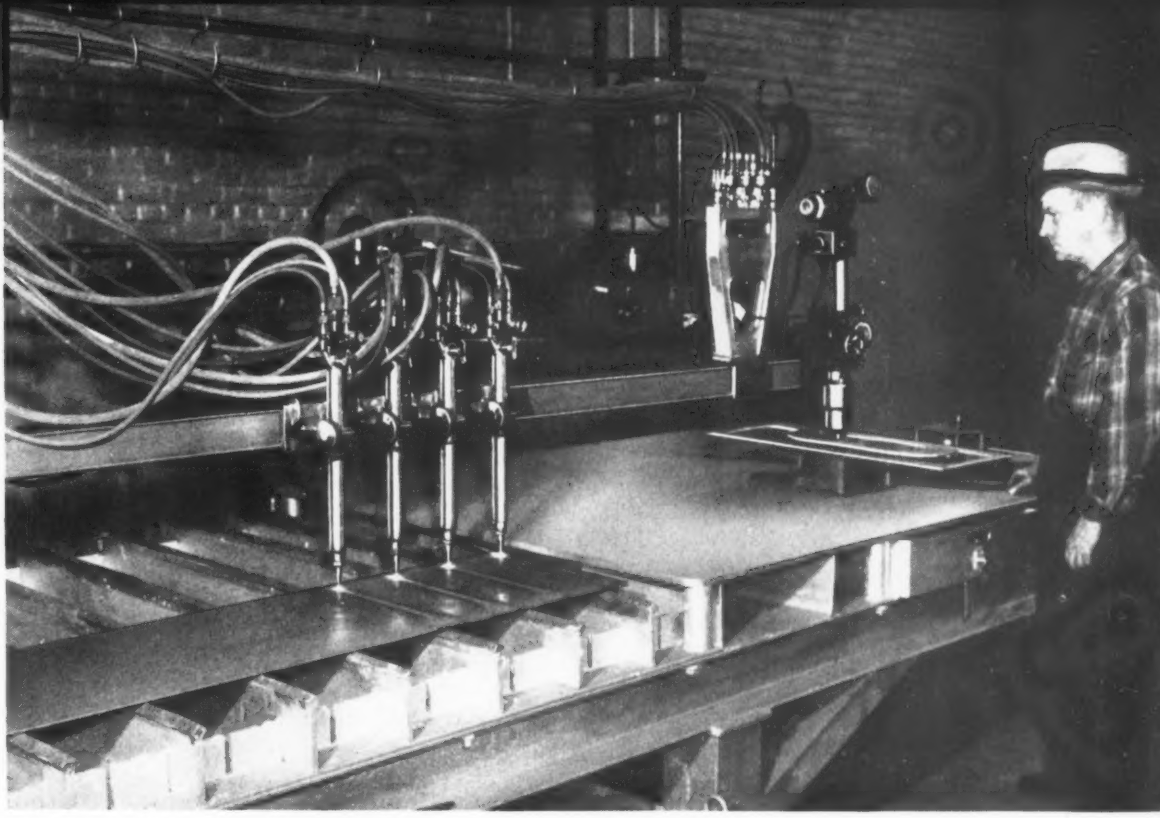


Fig. 5. (Below) Boring a Section for a Torpedo Tube on One of the Larger Lathes of the Machine Shop

Nibbling machines are also employed for cutting plates to scribed outlines, as will be seen in Fig. 6, which shows a Savage nibbler in operation. This machine is used on mild steel up to 3/4 inch thick. Large plates are readily manipulated under the nibbling tool, as the plates are supported on Mathews ball transfers. These devices are assembled at the upper ends of pipes, on a level with two knurled rollers on the machine that support the plate under the nibbling tool, as seen in the illustration.

When a plate is fed to the nibbling tool, a small knurled roller attached to an arm at the right-hand side of the machine is lowered on the plate in back of the tool to hold it firmly on the bottom rollers. All three rollers turn freely as the steel plate is moved back and forth by the operator and his helper.

In Fig. 7 is shown a Farquhar hydraulic press employed for a large variety of bending on steel plate. In the particular operation illustrated, simple bends are being made on four bulkhead

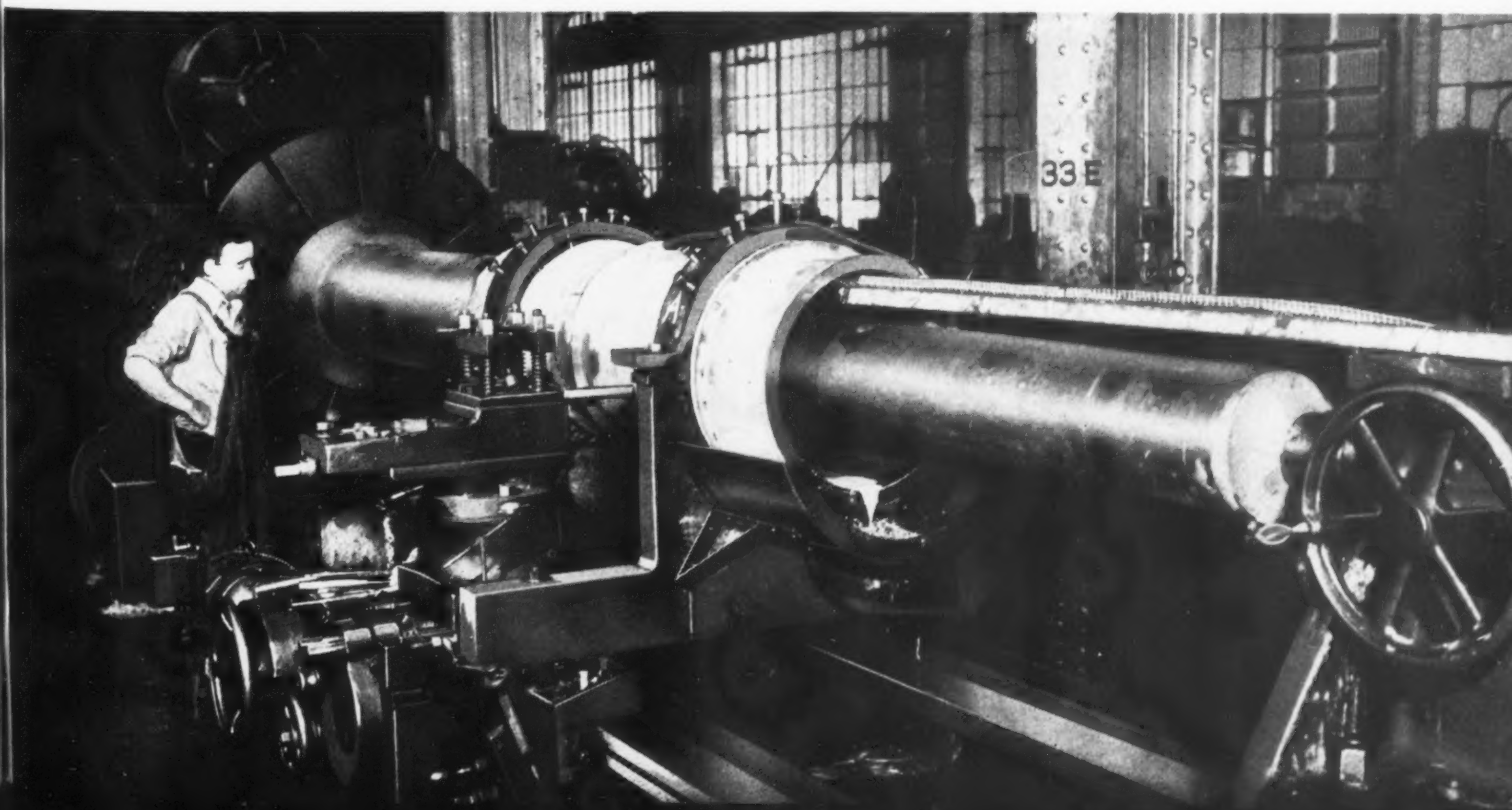


Fig. 6. (Left) Nibbling Machine Equipped with Ball Supports, Engaged in Cutting Steel Plate to a Scribed Outline

Fig. 7. (Below Left) Hydraulic Press Employed for a Wide Variety of Bending Operations on Steel Plate

Fig. 8. (Below Right) Welding Positioner Equipped with a Table that can be Tilted to Any Angle

stiffeners at one time. Steel plates up to 1/2 inch thick are bent cold on this machine, and up to 1 1/4 inches thick in a heated condition.

Most of the fabricated work is so large that the various members must be welded together with the units held stationary on the big floor plates of the shop, but smaller pieces are welded on Ransome positioners, as illustrated in Fig. 8. All welding is of the electric arc type. The positioners enable the work to be turned to any position, so that welding can always be performed on horizontal surfaces. On the machine is a built-up door frame which is to be mounted on a bulkhead for a water-tight door. Several flood-valve rings are seen in the illustration lying on the floor in front of the machine, on which a heavy bronze bead has been deposited by the oxy-acetylene process.

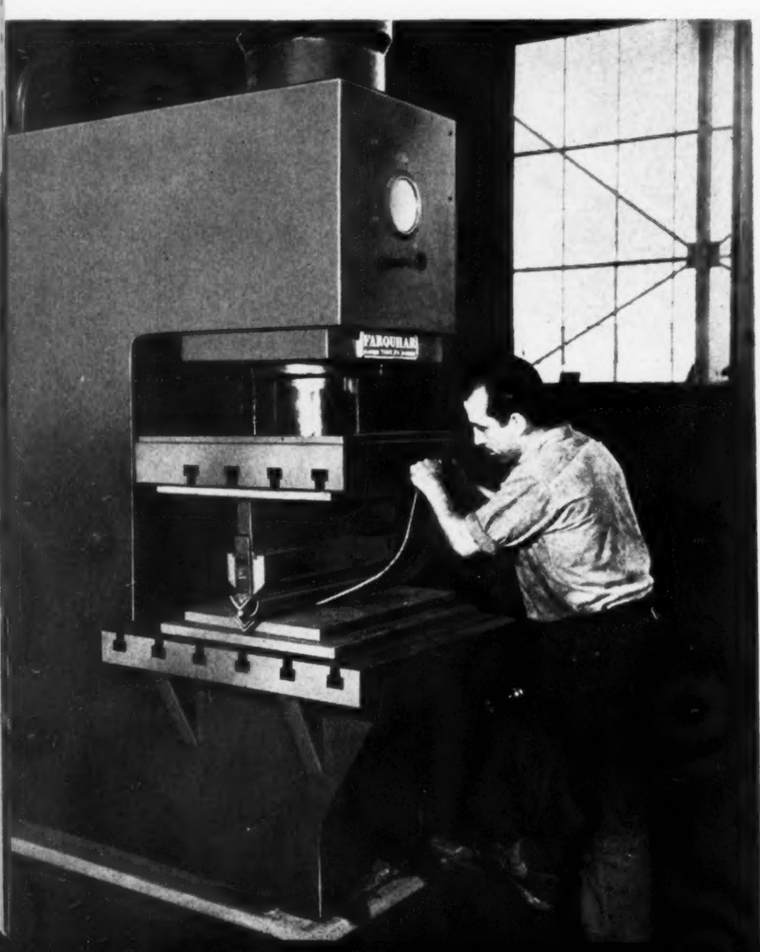
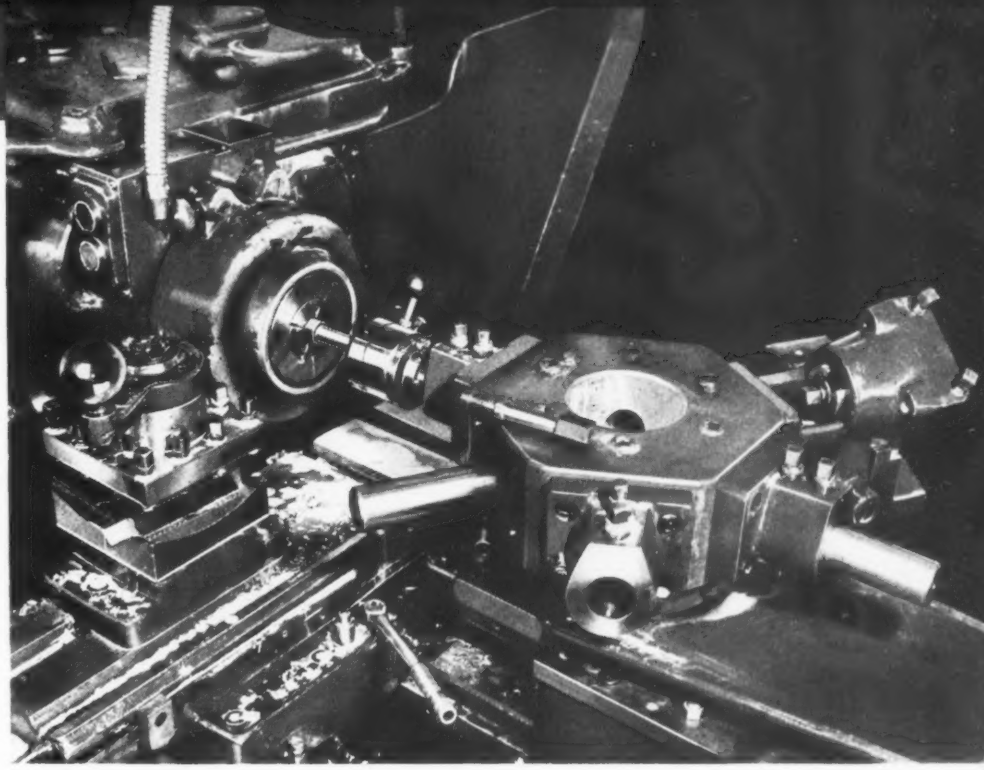


Fig. 9. (Right) Turret Lathe Tooled up for High Production of Special Types of Studs Used in Valve Assembly

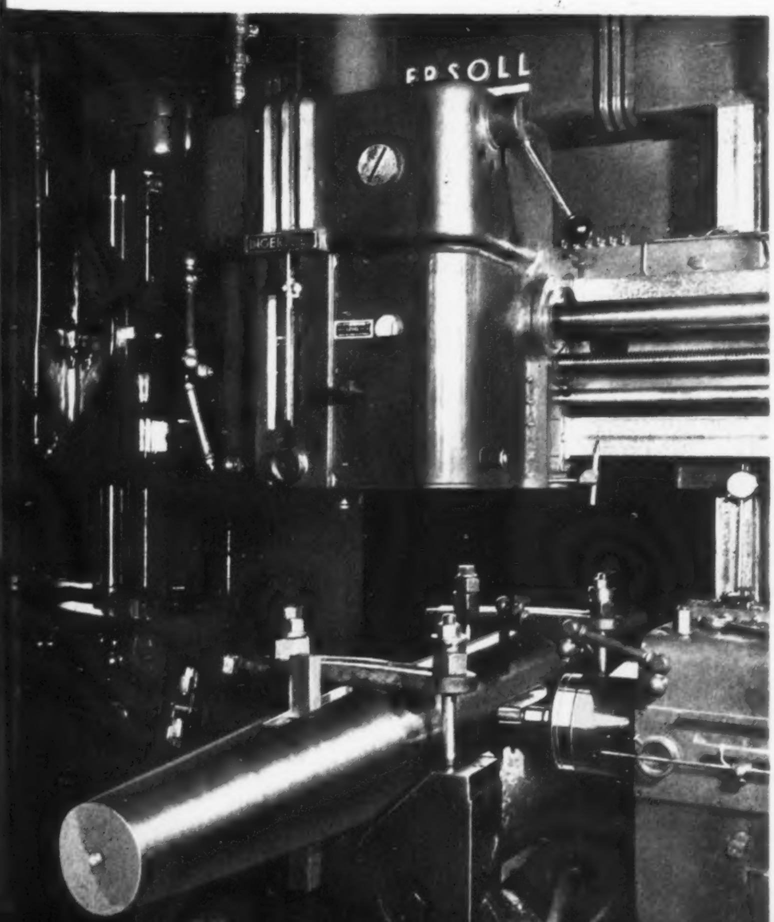
Fig. 10. (Below Left) Milling Keyways in Stern Diving-plane Shaft by Employing a Planer Type Milling Machine

Fig. 11. (Below Right) Machining Torpedo-tube Firing Valves on a Vertical Turret Lathe



Although the submarine engines are not built in this shipyard, a large machine shop is necessary for finishing the many forgings and castings required in submarine construction. In Fig. 5 is shown a typical operation on a large Niles lathe. It consists of boring the muzzle section of a 21-inch torpedo tube around cylindrical seats at the ends and raised bearing surfaces that run lengthwise through the bronze castings. This section of the torpedo tube is approximately 6 feet 8 inches long; some sections are as long as 9 feet.

The torpedo-tube section is mounted on the lathe carriage and fed along the boring-bar for the operation. The boring-bar is of two diameters—about 18 inches for half its length and 12 inches for the remaining half. A cutter-head is attached to the shoulder where the large-



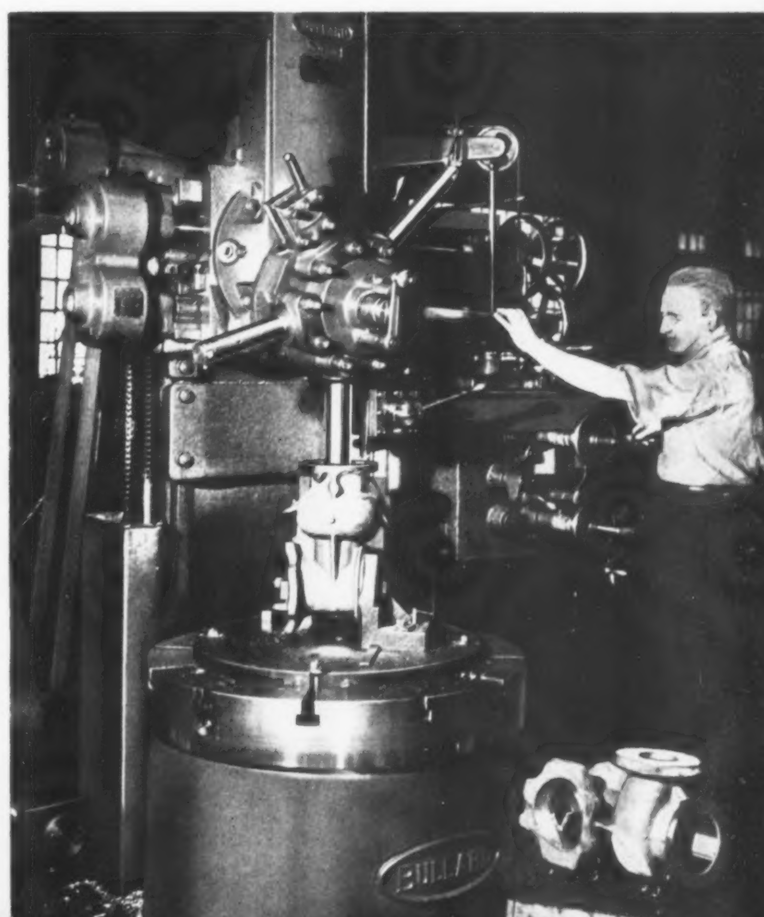
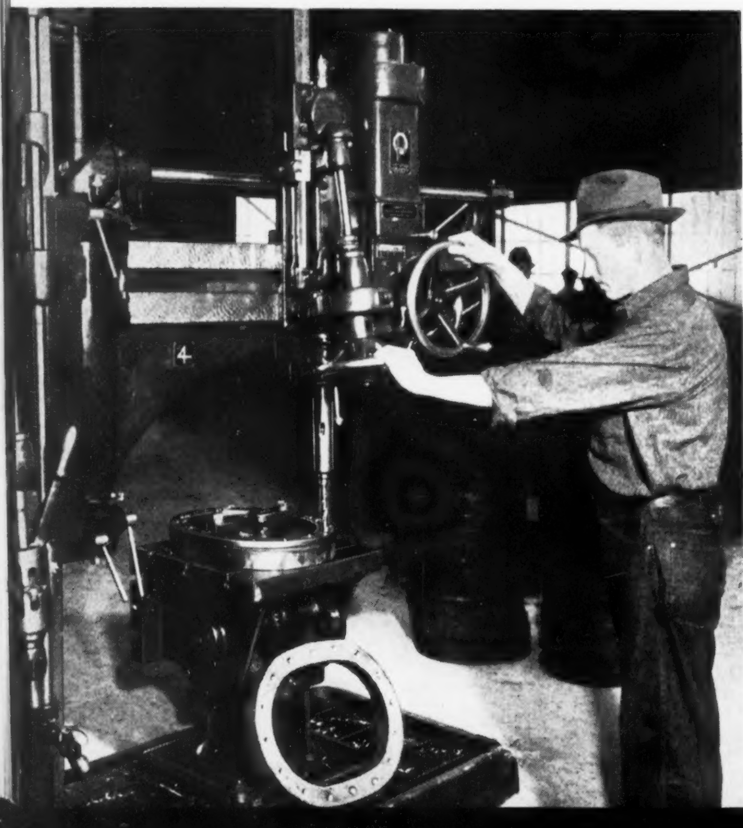


Fig. 12. Milling Machine Set-up Used in Gashing Gear Teeth around a Segment of Locking Dogs by Means of a Single Cutter and then Finishing the Teeth with a Hob

Fig. 13. Employing a Radial Drilling Machine for the Jig Drilling of Manhole Rings to Suit the Drilled Cover Plates



diameter surface joins the smaller. In roughing, twelve radially positioned cutter bits are applied simultaneously. For finishing, two cutter-bits located diametrically opposite each other are used. Oil is fed directly to the cutters through the flexible hose seen extending into the torpedo tube. Finished dimensions are held to within an unusually close tolerance, this being one of the most important operations in the machine shop.

A keyway is being milled in a stern diving-plane shaft by the Ingersoll planer type milling machine shown in Fig. 10. Six keyways are milled in this shaft, two in each of the tapered ends and two in the cylindrical portion in the middle. The keyways of each pair must be 180 degrees apart within close limits. They are 12 inches long. The shaft itself is approximately 8 feet in length, and has a maximum diameter of about 9 inches. There are two milling heads on the cross-rail of the machine and two side-heads, all of which are used simultaneously in certain operations.

A typical set-up on one of several Bullard vertical turret lathes is illustrated in Fig. 11. The operation shown consists of machining four bores of torpedo-tube firing valves, and turning and facing a flange on the outer end of each bore. Dimensions are held within tolerances of plus or minus 0.0005 inch and plus or minus 0.001 inch. Five cutters are employed on the turret in taking the various boring cuts, and three cutters on the side-head for turning and facing the flanges. The valves are brass castings.

Studs for large valves are being cut from copper-nickel bar stock of hexagonal cross-section by the Gisholt turret lathe shown in Fig. 9. One of the finished studs may be seen lying on top of the turret. After the stock has been fed against the turret stop seen extending to the right, a box-tool in the next station of the turret turns the front end of the bar to a thread diameter. The Geometric die-head seen in operation is next advanced for cutting a 5/8-inch diameter thread with eleven threads per inch.

The stock is then advanced against a second stop on the turret, after which a solid ring or shoulder is turned in back of the thread by a tool on the square turret of the cross-slide. Then a second tool on the cross-slide turret is used for turning a long neck of reduced diameter in back of the solid ring. Finally, the hexagonal end of the stud is cut off by a third tool on the square turret of the cross-slide.

A rather unusual job on a Brown & Sharpe milling machine is illustrated in Fig. 12. This consists of milling a gear segment on locking dogs for water-tight doors. One of the finished dogs and a cut-out blank are seen at the right on the table, together with a single milling cutter that is used for gashing out the teeth. In gashing the teeth, one tooth is, of course, cut at a time, the dividing head providing a means of accurately indexing the work from tooth to tooth in relation to the cutter.

At the end of the roughing operation, a hob is substituted for the single milling cutter and the dog is so mounted on the spindle of the dividing head that it is free to turn when the hob is fed tangentially through the dog teeth. About eight cuts are taken in this manner to obtain the desired tooth finish and accuracy.

There are two comparatively small machine shops in the shipyard for the use of "outside" machinists—that is, the machinists who actually install parts on the submarines and who, in many cases, must fit the work to the job. The remaining illustrations show operations in those shops.

A typical operation on a radial drilling machine is seen in Fig. 13. It consists of spotting eighteen holes around manhole rings through the use of jig plates. These spotted holes must line up with holes drilled through the manhole cover plates by using the same jigs. The jigs consist of simple rings of steel plate that have been fitted with drill bushings. The radial drilling machine was built by the Western Machine Tool Works, and is equipped with a tilting table.

In Fig. 14, is shown a three-head Edlund drilling machine used for drilling and tapping holes in trim liners for ballast tanks. The right-hand drill serves as a countersink to remove any burrs produced in drilling and tapping. Twelve holes are machined in each liner. Liners of different types, ranging from 3/4 inch to 1 3/4 inches in thickness, are drilled and tapped on this machine. On the larger sizes of liners, the holes are blind.

An example of multiple shaping is shown in Fig. 15, where thirty steel blocks are clamped in a vise and machined with one feed of the table past the reciprocating ram. The blocks are shaped on all four sides by turning them around 90 degrees after each side has been machined. A cut approximately 1/8 inch deep is taken all around these blocks, which serve as windlass liners on submarines.

Fig. 14. Three-spindle Drilling Machine being Used for Performing Drilling, Tapping, and Countersinking Operations on Liners for Ballast Tanks

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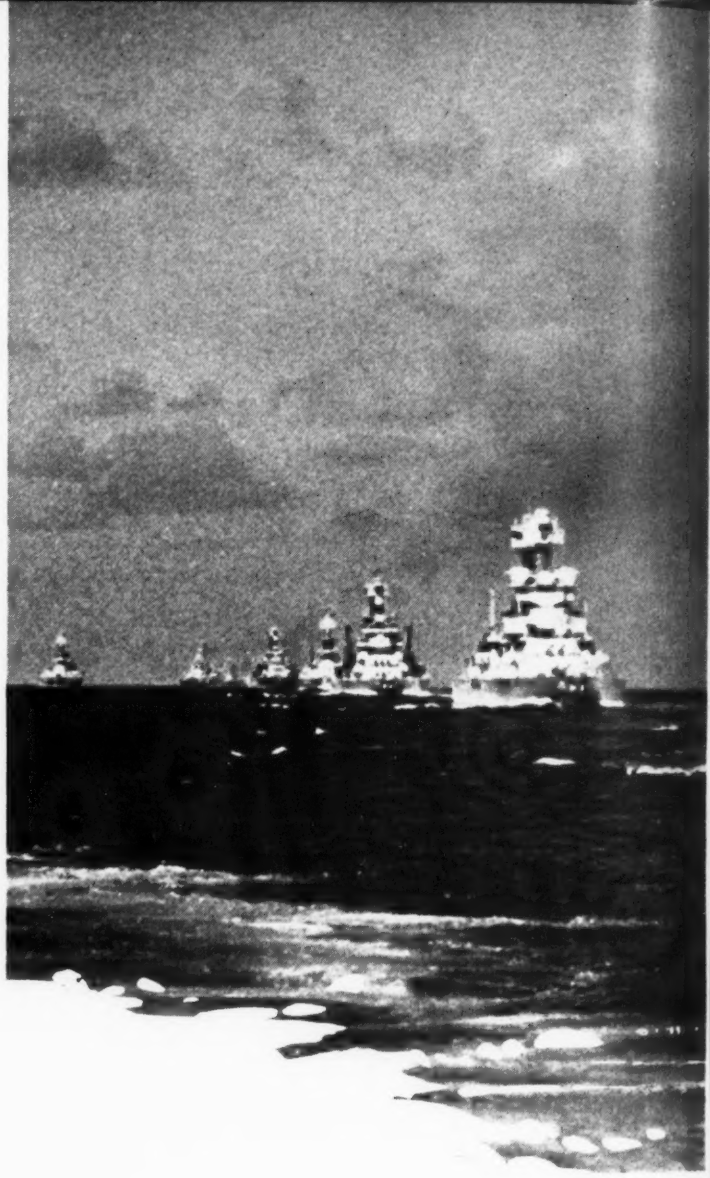
Fig. 15. Shaping Several Steel Blocks Simultaneously for Use as Windlass Liners on Submarines

Bethlehem's Fore River Yard

How Battleships, Cruisers, Aircraft Carriers, and Other Naval Vessels are Being Built Today in One of the Country's Oldest Shipyards

By WARREN B. NOTT
Superintendent of Machinery, Fore River Yard
Bethlehem Steel Co., Shipbuilding Division



CLOSE to two thousand seagoing vessels ranging from trawlers to luxury liners and from submarines to battleships have been built in the shipyards of the Bethlehem Steel Co. This huge fleet for commerce and national safety adds up to a total displacement of considerably over six million tons. With such an experience in shipbuilding, it is small wonder that the United States Navy and the Maritime Commission have awarded huge contracts to this corporation, with the confidence that the vessels ordered will be turned out in record time.

Five Bethlehem shipbuilding yards are engaged in filling these contracts. Three of them are on the Atlantic Coast and two on the Pacific Coast; in addition, the corporation operates eleven other yards that are engaged entirely in making ship repairs. The shipbuilding yards are operated twenty-four hours a day, seven days a week.

Of these Bethlehem shipbuilding yards, the largest and most important is the Fore River Yard at Quincy, Mass., which has been building war vessels for the United States Navy since 1900. This yard has been owned by the Bethlehem Steel Co. since before the World War. It is now engaged on an imposing list of orders, which include a battleship, aircraft carriers, cruisers, destroyers, trawlers and tankers for our two-ocean Navy, the total being valued at over $600,000,000.

Facilities at this shipbuilding yard have been greatly expanded during the past year to expedite the huge manufacturing program. Typical operations in the machine shop and other metal-working departments are described in this article.

One of the latest machine tools in the enlarged machine shop is the Morton 72-inch draw-cut shaper shown in Fig. 1, which is adapted to a wide variety of boring and milling, in addition to shaping. In the illustration, the machine is shown cutting two keyways the full length of a tapered bore in a destroyer propeller, an operation that requires workmanship of the highest caliber. The width of the keyway must be to size within 0.001 inch for the full length of the bore, and the keyway must be square with the bore to a high degree of accuracy.

In this operation, the work is held at the angle of the bore taper by means of the special fixture seen in Fig. 3. This fixture is provided with a pivoted plate that can be adjusted to the required angular position and securely clamped. The hub on one end of the propeller is bolted to

Speeds Our Two-Ocean Navy

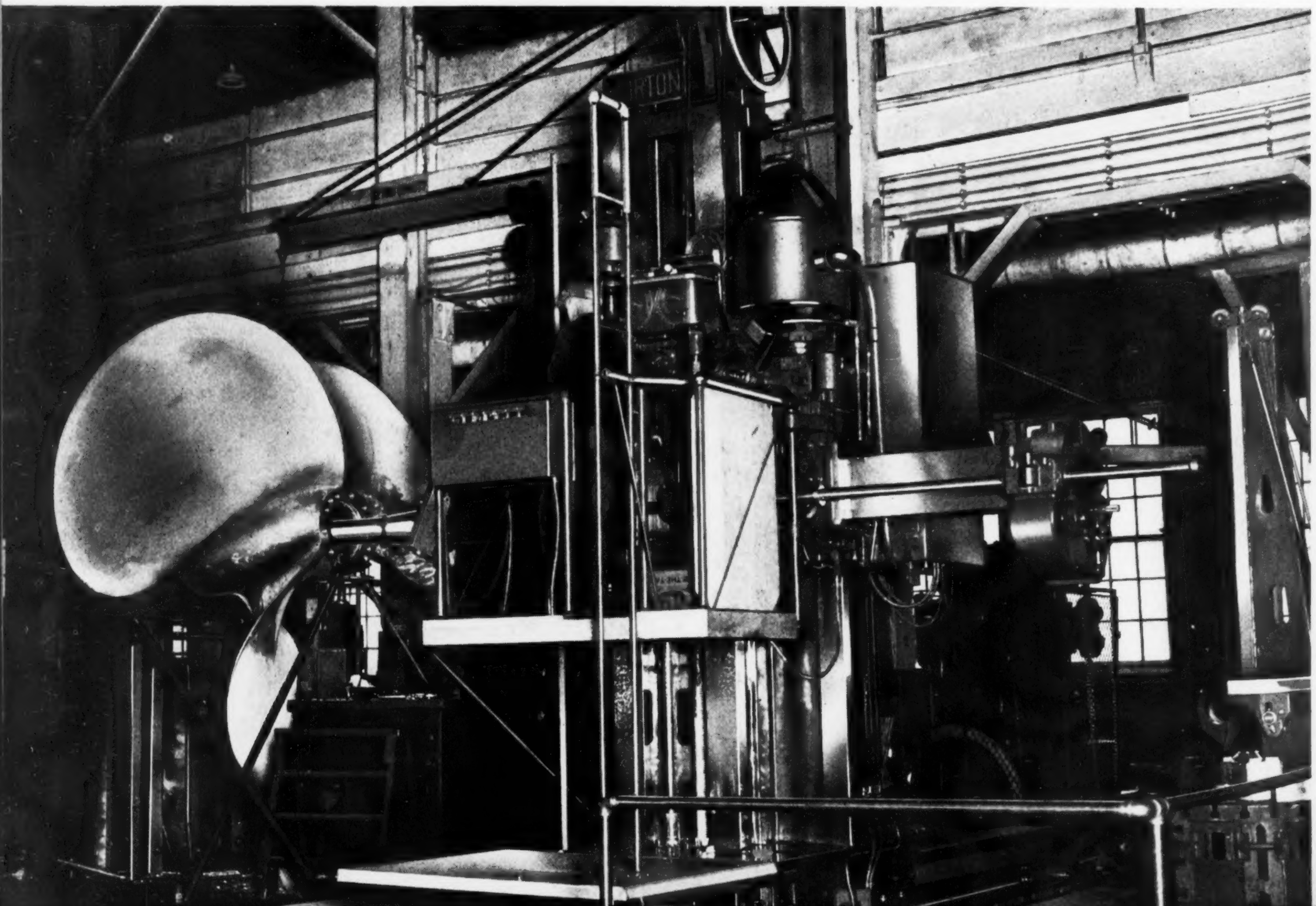
the adjustable plate by means of ten studs, which are screwed into tapped holes in the hub. The ends of the studs are inserted through holes in the adjustable fixture plate, and are fastened to the plate by means of nuts. With this arrangement, the propeller can be tilted downward for cutting one of the keyways, and then upward a corresponding amount for shaping the second keyway 180 degrees around the bore from the first keyway. The keyways must be finished in accordance with a plug gage that is provided by the Government. They are produced by draw-cut strokes of the shaper ram.

The same draw-cut shaper is shown in Fig. 4 set up for end-milling a steel fabricated condenser head on the joint face, the condenser head being approximately 12 feet long by 12 feet high. During the machining of this large part, the operator stands adjacent to the stationary table on which the work is mounted and controls various machine movements through a pendent switch. Other movements of the machine are controlled by a helper, who stands on the platform at the front of the column. The column is slid in and out on the ways of the bed and the ram head is moved up and down on the column to feed the cutter around the irregular contour of the surface being milled.

The capacity of modern machine tools and cutters for the heavy removal of metal is illustrated in Fig. 8, which shows the Morton draw-cut shaper being applied on an experimental job which necessitated the shaping of armor plate. At the time that the photograph was taken, a Carboloy cutter held in an OK tool-holder was cutting the armor plate to a depth of 7/8 inch with a feed of 1/16 inch and a speed of 40 feet per minute.

Anyone familiar with shipbuilding knows that the machine shop must be operated on a jobbing shop basis, because the quantity of work passing through the shop at one time is generally small. Nevertheless, many jigs, fixtures, and tools have been provided which are set up

Fig. 1. Cutting Keyways in a Destroyer Propeller by Employing a Large Draw-cut Shaper Having a Maximum Stroke of 6 Feet



from time to time on the machines for which they are intended and just as often sent back to storage. In Fig. 5 is shown a Rockford open-side hydraulic planer set up with a simple work fixture and an ingenious tool-head that greatly facilitate the performance of a highly important operation on stern tube bushings.

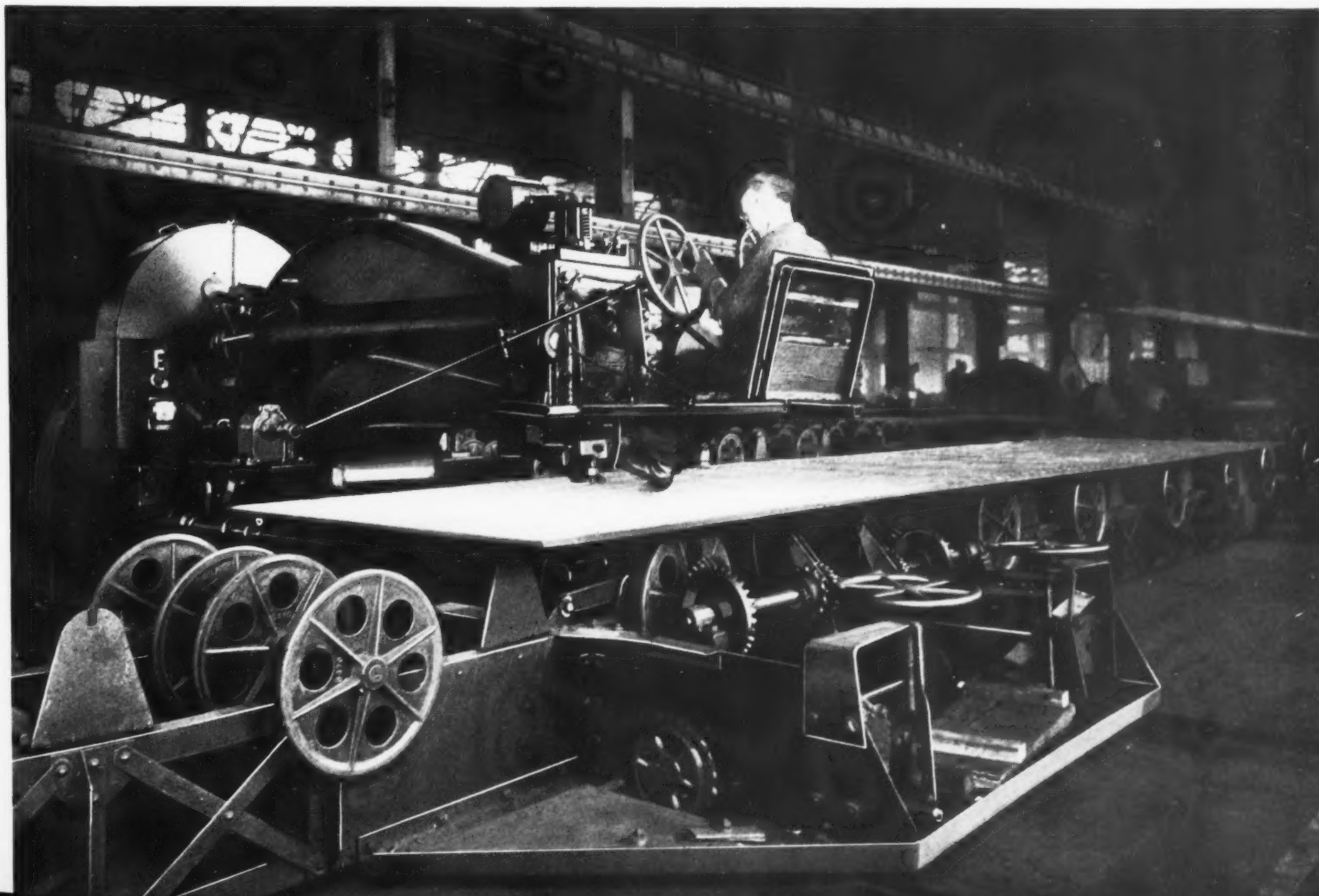
The operation consists of finishing wide grooves around the inside of the bushings to receive rubber-coated bronze bars that extend the full length of the bushings and provide a bearing surface for the propeller shaft. At the time that the photograph was taken a cut was being made down the side of one of the lands. The bottom surfaces of these grooves are cut tangential, and all must be located within a tolerance of 0.002 inch from the center of the bore. The width of the grooves is held within 0.001 inch. These dimensions are checked by means of "Go" and "No Go" gages.

For this operation, the tool-head is positioned centrally with respect to the carefully lined up stern tube bushing. The special tool-head is provided with a slide for feeding the cutter across the grooves. The bushing is a bronze casting about 4 feet long. The cutting speeds on this planer can be adjusted from 0 to 50 feet a minute, and the return speed is three times as fast as the cutting speed.

An unusual operation on a Giddings & Lewis table type horizontal boring, drilling, and milling machine is illustrated in Fig. 6. This consists of finish-milling the jaws of a flexible coupling on one end of a high-pressure turbine rotor. Before this operation is performed, three holes are drilled through the excess stock between each pair of coupling jaws, and the excess stock remaining after the drilling is chipped away by the application of a portable pneumatic hammer. In this way, the amount of stock that must be removed by milling is greatly reduced.

For the milling operation, the rotor is mounted, as illustrated, in the V-grooves of a heavy fixture, which is provided at the left-hand end with

Fig. 2. Punching Ship Plates in the Fabricating Shop on a Punching Machine Equipped with a Long Roller Locating Table



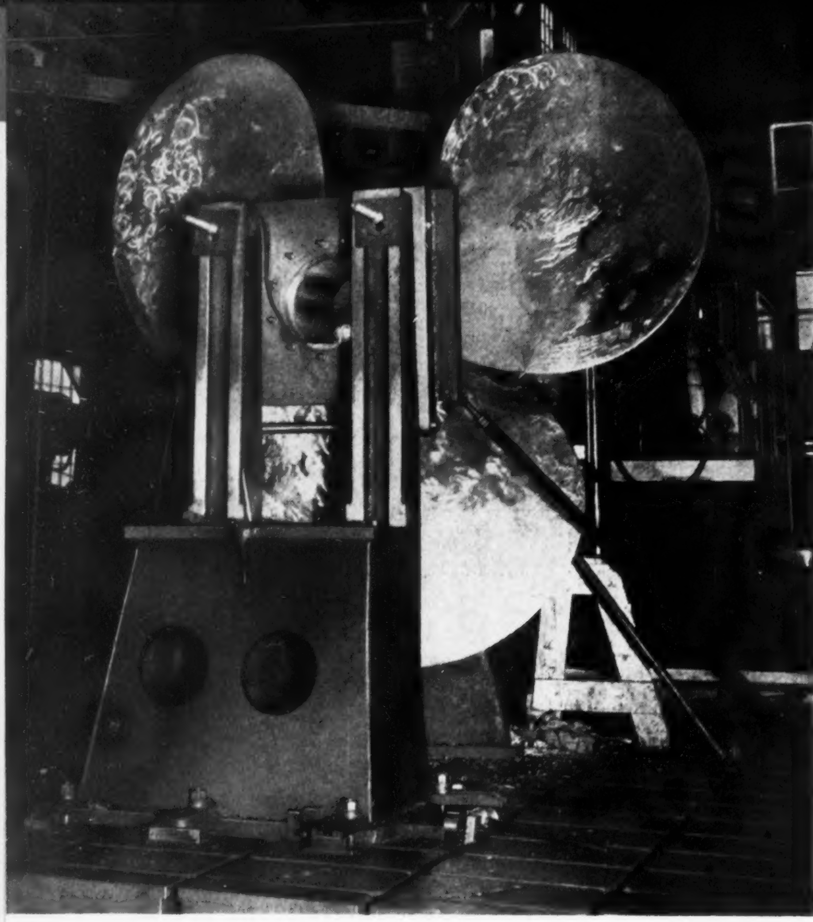


Fig. 3. Special Fixture Used on the Draw-cut Shaper Shown in Fig. 1, which Enables Propellers to be Tilted to the Angle of Bore Taper

a large indexing plate. Bushed holes near the periphery of this plate are used in conjunction with a plug that is slipped through the holes into engagement with the top of a hardened block for locating the coupling jaws successively in line with the milling cutters. Two milling cutters are mounted on the machine spindle for simultaneously milling the opposite sides of each coupling jaw with one movement of the work horizontally past the cutters.

The two side mills used in this operation are approximately eight inches in diameter. The outer corners of the cutters are rounded so as to provide a fillet at the bottom end of the milled surfaces. Because of the heavy weight of the work and the necessity of extending the table a considerable distance beyond the bed, a crane is employed to support the overhanging end of the table. This is accomplished by applying a rope sling to the fixture and attaching the sling to a hook suspended from the crane hoist.

Probably the most unusual drilling operation in this shop is performed on armor grating. It consists of drilling large numbers of holes, 5 inches in diameter, through the grating. From fifty to several hundred holes are drilled in one piece of grating, the number depending upon the over-all dimensions of the grating.

This operation is performed by employing a Cincinnati Bickford radial drilling machine in the manner shown in Fig. 7. First, the end holes to be drilled in each row are laid out. Then these holes are drilled, after which templets such as seen at the right-hand end of the grating in the illustration, are employed for locating the remaining holes, the templets being fastened to the drilled end holes.

In producing these holes, a 2-inch diameter drill is used first, this drill being run at a speed of 88 R.P.M., with a feed of 0.014 inch per revolution. After all the holes in one group have been drilled to this size, a head with a fly cutter is substituted for the drill, and a bushing of suitable size is slipped into the templet opening. The holes in the grating are then enlarged to a

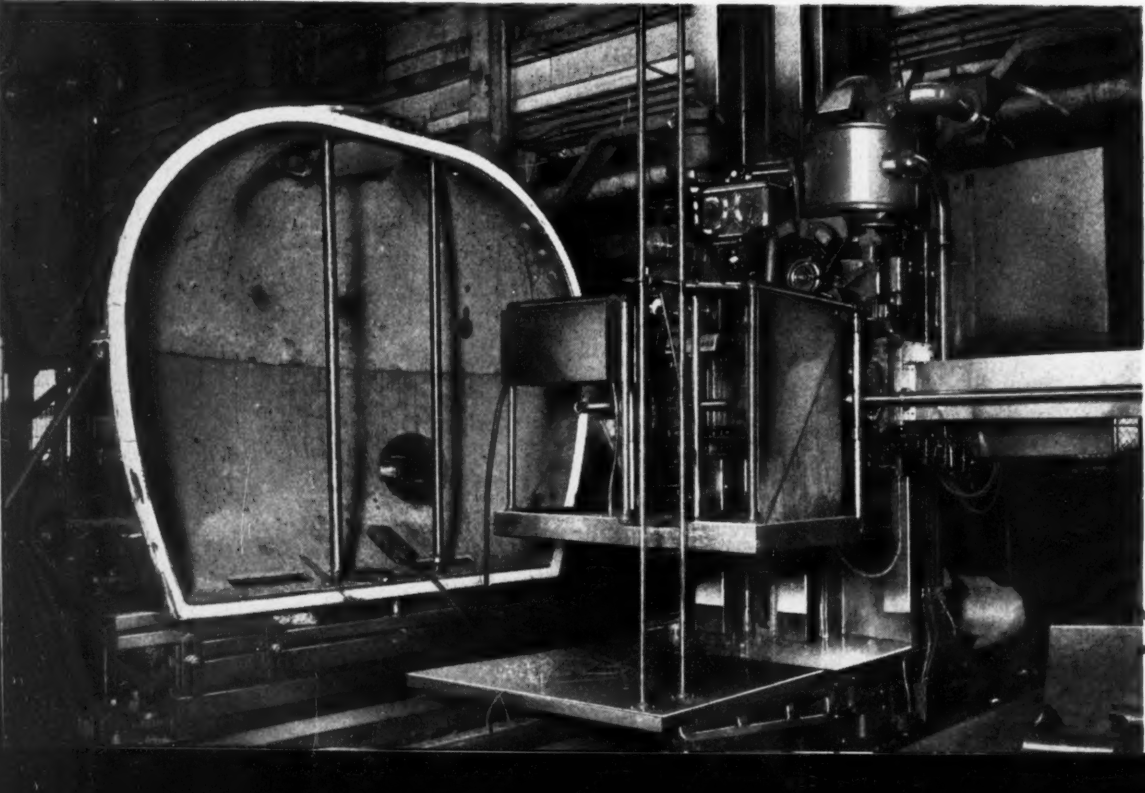


Fig. 4. Employing a Draw-cut Shaper for End-milling the Joint Surface of a Large Condenser Head

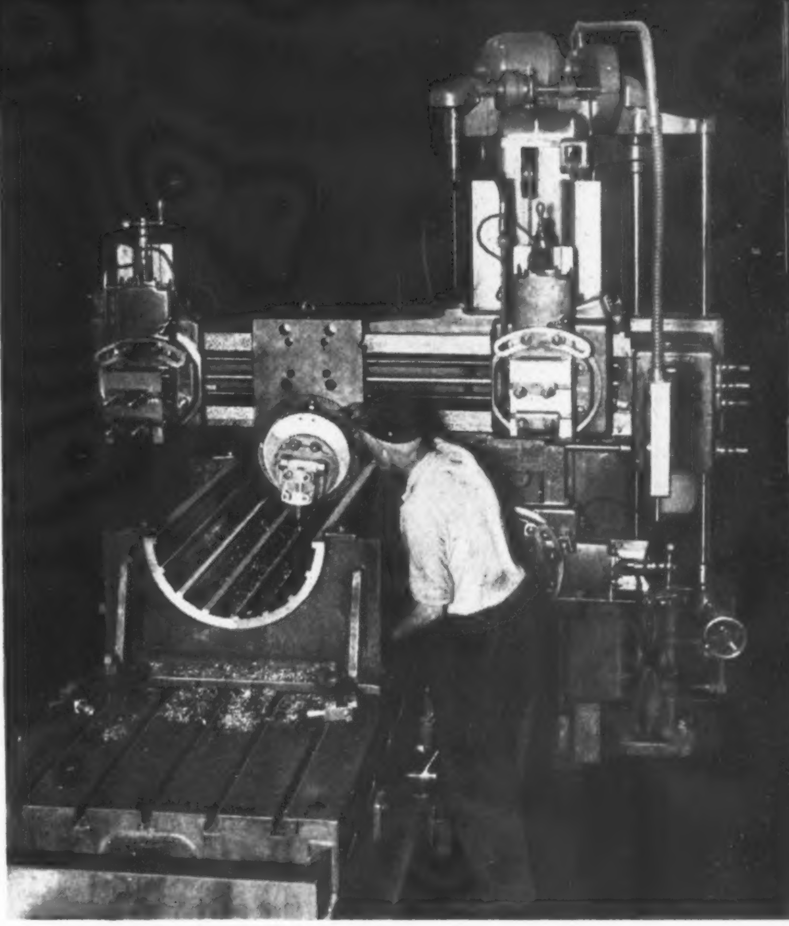


Fig. 5. Machining Grooves in a Stern Tube Bearing to Receive Rubber-coated Bronze Bars that Provide the Bearing Surface

diameter of 3 1/4 inches, the fly cutter being driven at a speed of 34 R.P.M. and fed downward at the rate of 0.017 inch per revolution. When all the holes in one group have been bored to the size mentioned, an OK cutter-head fitted with inserted blades of high-speed steel is substituted for the fly cutter, and other bushings are provided in the templet openings. With this cutter, the holes are enlarged to a diameter of 5 inches. This cutter is run at a speed of 24 R.P.M., and is also fed at the rate of 0.017 inch per revolution.

Frequent grinding of the drills and cutters is necessary on account of the extreme hardness of the armor plate near the top and bottom surfaces and the toughness of the metal between these surfaces. The thickness of the grating varies with different types of vessels. In building one cruiser, it was necessary to drill a total of 8954 holes through grating that was 6 1/2 inches thick.

The machining of turbine rotors requires the skill of an expert lathe operator, as will be apparent from Fig. 9, which shows the rotor for a low-pressure turbine in a Niles engine lathe. This lathe has a swing of 48 inches and accommodates shafts and other parts up to 25 feet long. All the rotor surfaces seen finished were machined in this set-up, including the grooves for the turbine blades. In machining these grooves, a series of form cutters must be employed, in order to obtain under-cut serrations of irregular contour.

Special equipment devised for performing a milling operation without tying up an expensive machine is illustrated in Fig. 10. This operation consists of milling each blade groove of turbine rotors with a serrating milling cutter for a distance of about 2 inches along the circumference to obtain "windows" for inserting calking pieces and to close up the rows of blades. As the "windows" are not in line, the rotor must be revolved for locating the work to suit each step of the operation. The equipment consists simply of V-blocks for supporting the work, and

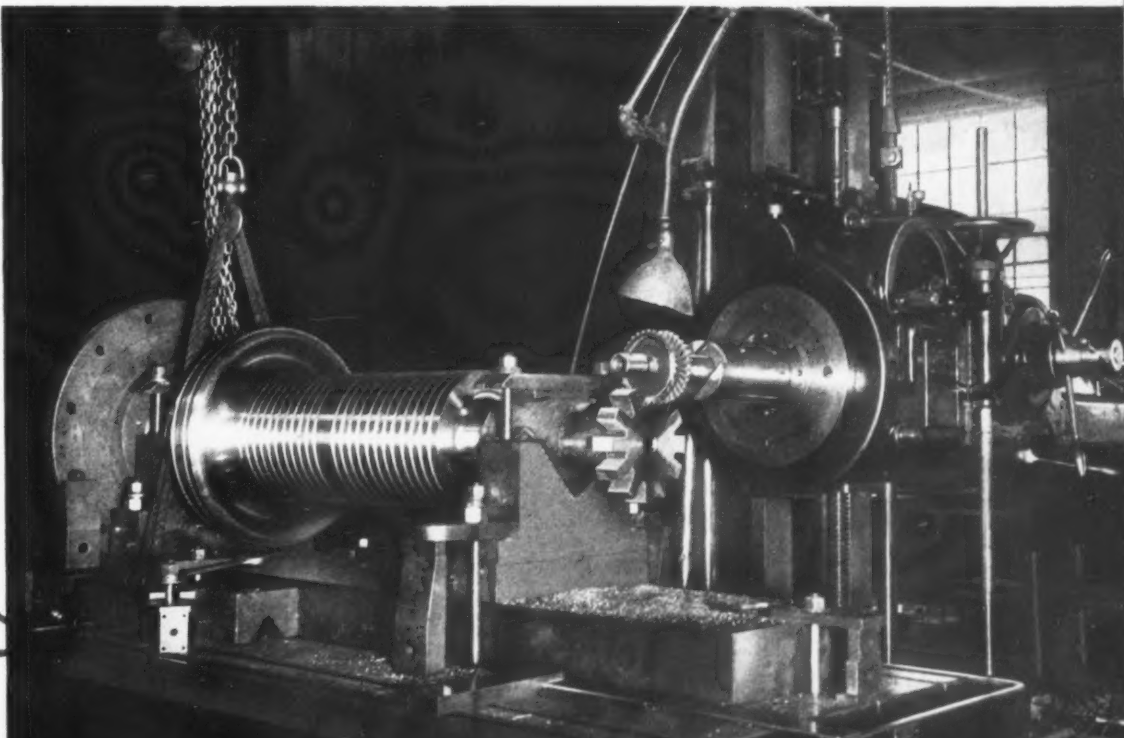


Fig. 6. Special Set-up Provided on a Horizontal Boring Machine for Milling Teeth on a Turbine Rotor

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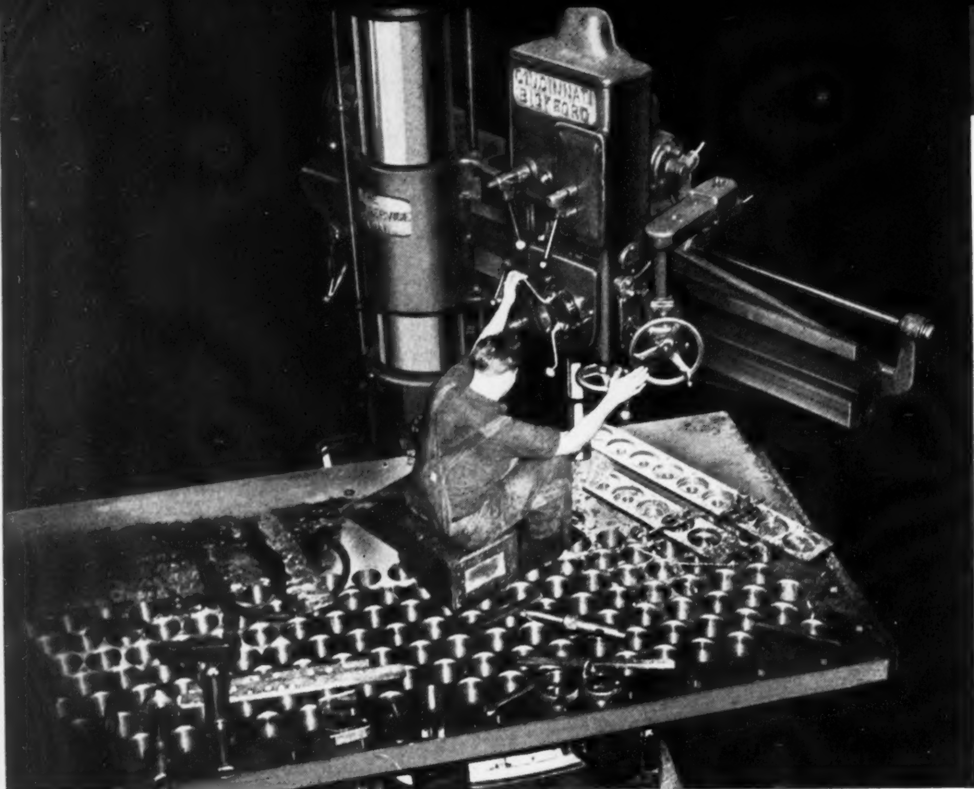

Fig. 7. Equipment Used in Drilling Large Numbers of 5-inch Holes through Armor Grating on a Radial Drilling Machine

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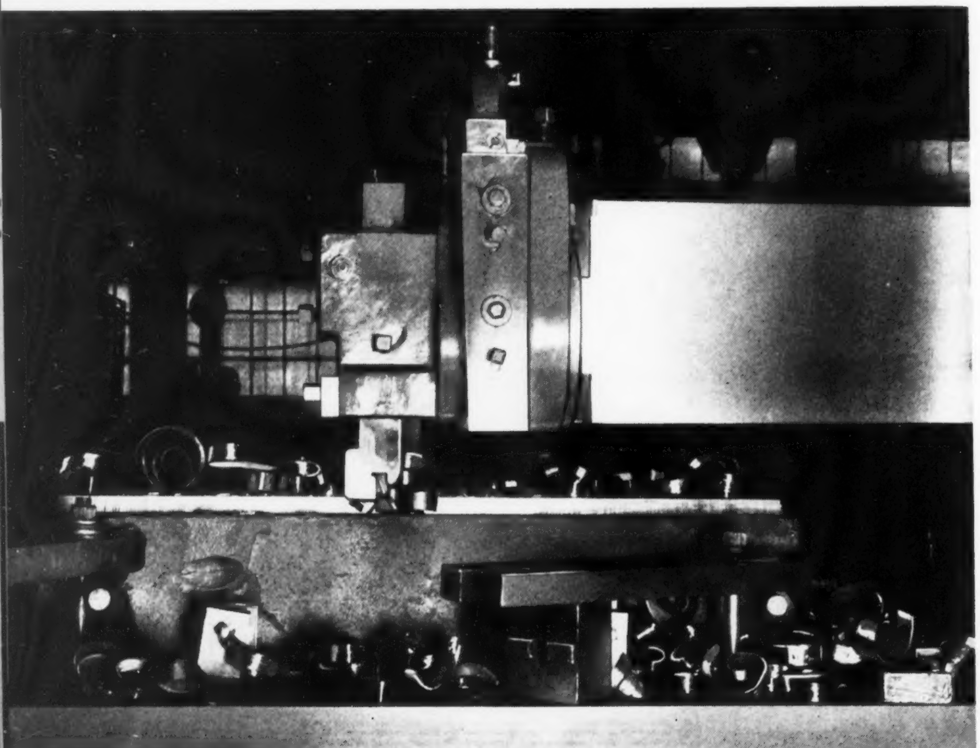

Fig. 8. Taking a Shaping Cut on Armor Plate to a Depth of 7/8 Inch with a Feed of 1/16 Inch and a Speed of 40 Feet a Minute

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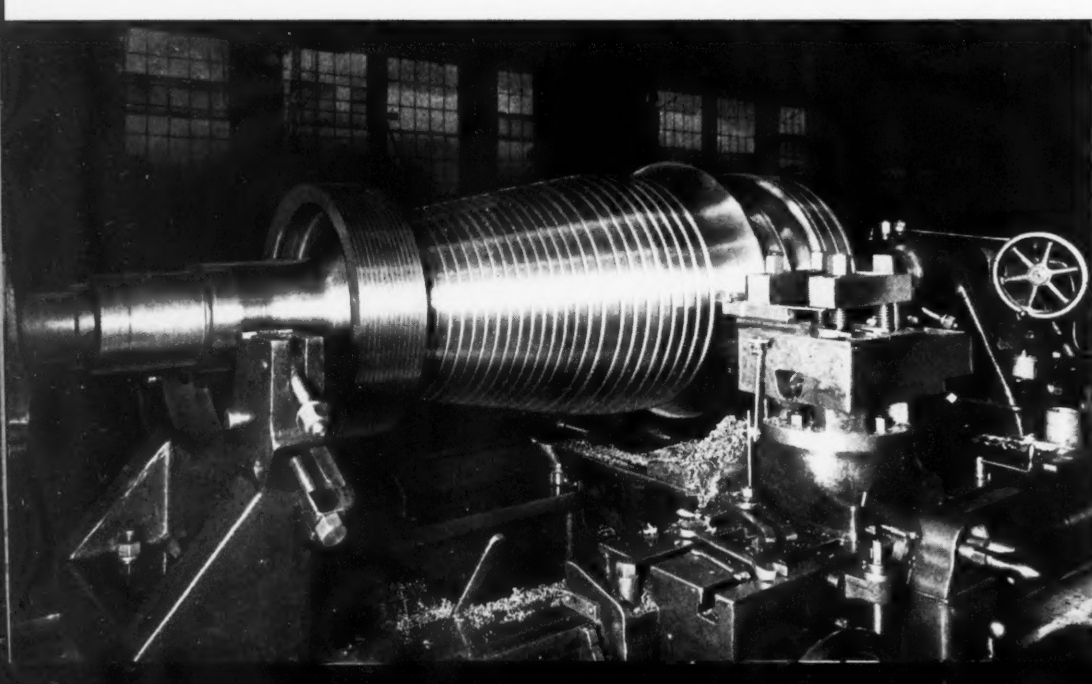

Fig. 9. Lathe Operation in which Finishing Cuts were Taken on a Turbine Rotor, Including the Cutting of the Various Blade Grooves

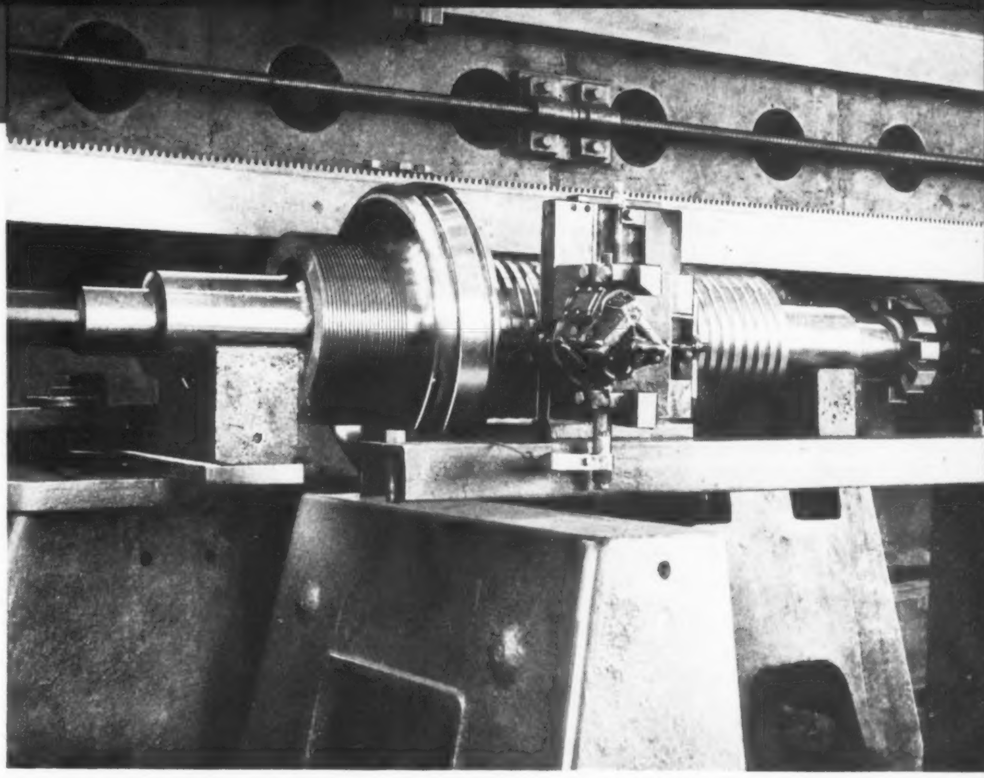

Fig. 10. Equipment Developed to Simplify the Milling of Slots along the Blade Grooves of Turbine Rotors

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a double slide unit on which a Chicago Pneumatic portable drill is attached. An end-mill is mounted in the end of the drill spindle.

From the illustration it will be apparent that vertical and sidewise movements of the drill can be effected by applying socket wrenches to the ends of the lead-screws with which the two slides are provided. In this way the end-mill can be fed to depth and then moved vertically to cut the slots to the required length.

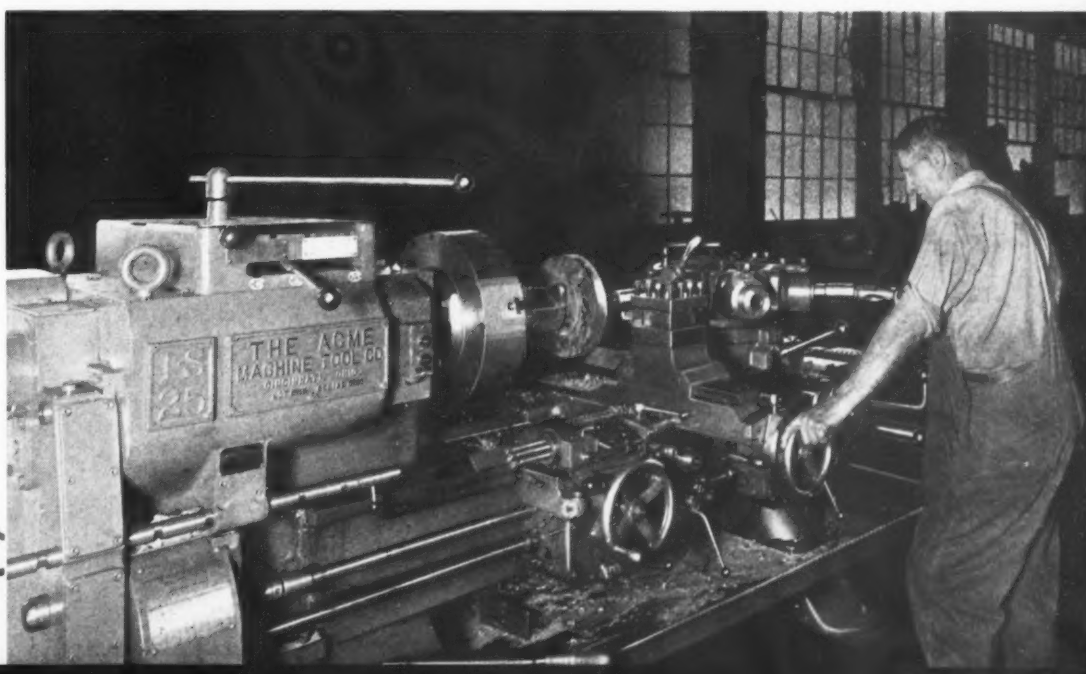
Some operations are performed frequently enough to require high-production equipment, such as the Acme turret lathe shown in Fig. 11, which is tooled up for machining valve-bonnet castings of carbon-molybdenum steel. Turning, drilling, boring, and facing cuts are taken with tools mounted on the hexagonal turret and on the square turret of the cross-slide. The hexagonal turret is equipped with a cross-feed which provides a high degree of flexibility in operations that involve boring and facing especially.

The Stellite seat in a large high-pressure steam valve is being bored and faced in the operation shown in Fig. 12, which is performed on a Bullard vertical turret lathe. Cutters are used on all five stations of the turret in this operation. The valve is a carbon-molybdenum steel casting. A similar operation frequently performed on this machine consists of turning, facing, and boring valve bonnets, an operation in which tools are used on the side-head, as well as on the turret.

Special equipment applied to a Niles boring mill for machining the crankpin on a large crankshaft section is illustrated in Fig. 13. The equipment consists of a tool-bar long enough to be supported in blocks attached to the rams of the two tool-heads on the cross-rail of the machine. This special bar is "bellied out" in the center for clearing the crankpin.

In the operation, a tool was first mounted on the top side of the bar, as illustrated, and a cut

Fig. 11. Typical Turret Lathe Operation, in which the Machine is Set up for Machining a Valve-bonnet Casting of Carbon-molybdenum Steel



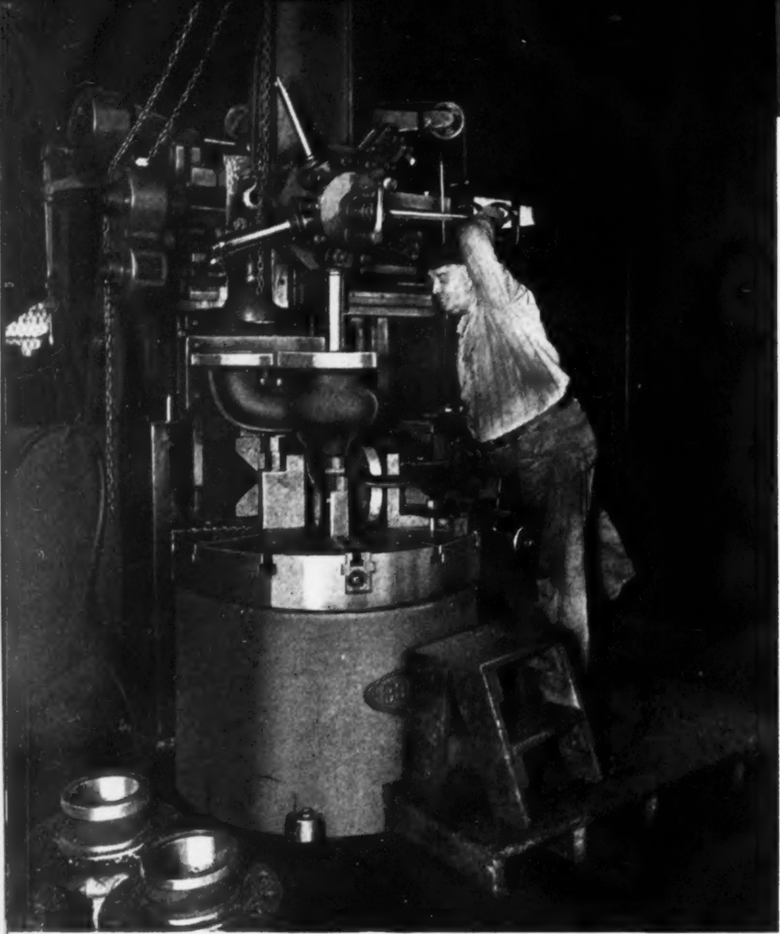


Fig. 12. Valve Boring and Facing Operation on a Vertical Turret Lathe, which is Typical of the Work Assigned to This Machine

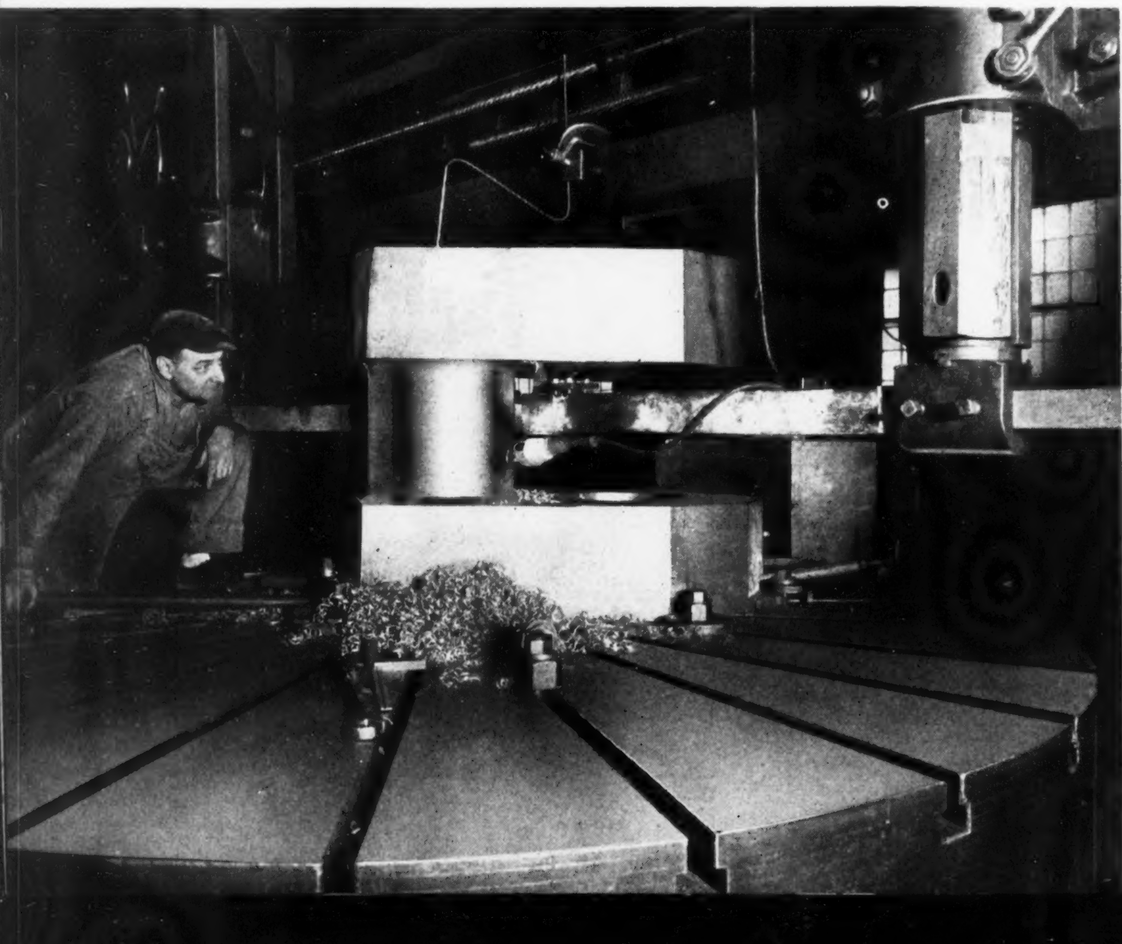
taken from the middle of the crankpin to the upper crank cheek. This was accomplished by feeding both tool-heads upward at the same time that the machine table was being revolved. Then the tool was mounted on the under side of the special bar and a cut was taken from the middle of the crankpin to the bottom cheek by feeding the tool-head downward, thus completing the turning of the crankpin for its full length.

Shops where this type of work is commonly handled would be equipped with a regular crank-turning lathe, but in the absence of such equipment, the boring mill set-up illustrated proved an excellent substitute. The boring mill has a normal swing of 16 feet, but by sliding one housing to the back of the machine, a swing of 26 feet can be obtained when necessary.

The typical boring mill operation shown in Fig. 14 consists of machining the side outlet of a large valve casting. After the outlet has been bored, it is threaded for a pipe connection, also on the same machine. Valve bodies seen in the left background are also handled on the same machine, which is a Universal boring mill of the table type. In addition to being bored and threaded, these castings are face-milled.

The various steel plates that are used in constructing the hulls of ships and sections of armor plate must be machined along the edges, and in the case of some armor plating, keyways must be planed along these edges. Operations of this type are performed on plate planers, such as shown in Fig. 15. This particular machine was built by the Niles Tool Works, and

Fig. 13. Turning the Crankpin of a Large Crankshaft Section by Means of a Special Boring-bar Used on a Vertical Boring Mill



has a length between the end housings of about 75 feet. In the operation illustrated, the edge of a comparatively thin plate is being trimmed, but the machine has been used on armor plate up to 12 inches thick. Cuts are taken by a cutter mounted on the carriage, which is fed lengthwise along the machine by a lead-screw approximately 9 inches in diameter. The work is held securely to the table of the machine by means of a series of overhead hydraulic jacks.

In Fig. 16 is illustrated a special portable type of machine designed for milling a tapered shoulder around thè corners of armor gratings. The radius of these grating corners is usually about 6 inches. In use, the machine is bolted to the grating, and after the cutter has been positioned for depth of cut, it is fed around the grating corner by the operation of a ratchet handle as shown. This handle actuates a worm that is connected with a large worm segment which extends around the base of the machine. An OK cutter with inserted blades is used. The cutter is shaped to the angle at which the grating is being milled.

Serrations are milled on both sides of the ends of high-pressure, side-locking turbine rotor blades by means of the special set-up shown in Fig. 19 on a Cincinnati plain milling machine. On the over-arm of this machine is a Sellew two-spindle vertical cutter unit, the spindles of which can be adjusted in and out by means of a screw provided with right- and left-hand threads. This adjustment enables the set-up man to obtain any required distance between the

Fig. 14. Employing a Horizontal Boring Mill for the Performance of Boring and Threading Operations on a Large Valve Casting

Fig. 15. Close-up View of Carriage on One of the Large Planers Used in Finishing Edges of Hull Plates and Armor-plate Sections

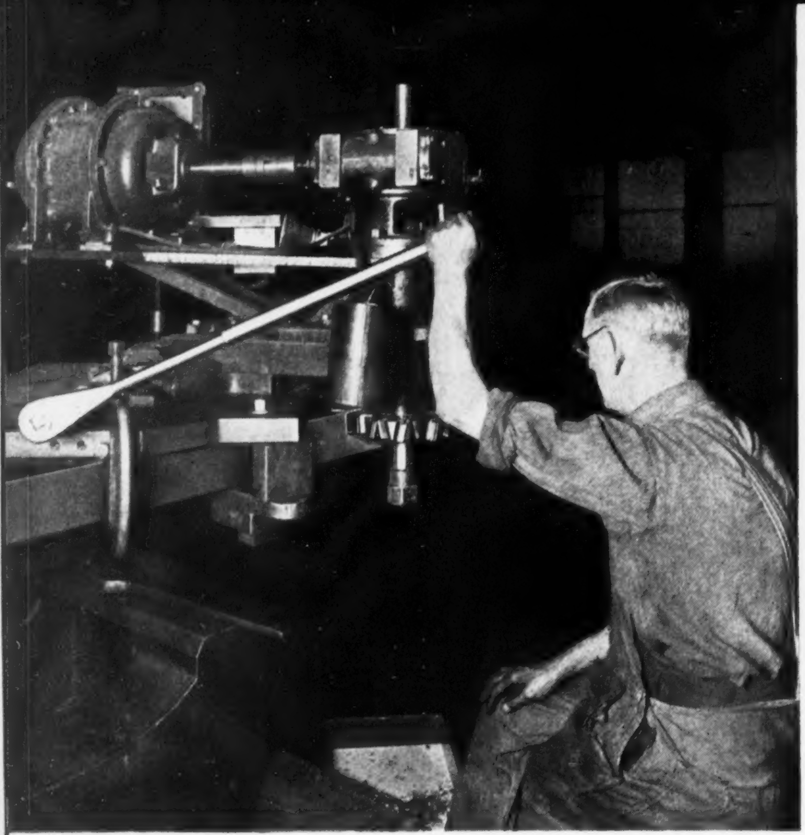


Fig. 16. Special Machine Devised for Milling a Tapered Shoulder around the Rounded Corners of Armor Grating

Fig. 17. Arc-welding Operation Performed in the Building of King Posts 80 Feet Long for Cargo Vessels

cutter-spindles. Form milling cutters, mounted on the lower ends of these spindles, mill the serrations across both sides of the turbine blades as the blades are fed between the cutters.

As the serrations must be milled to a radius, the machine is fitted with a special work fixture which is swung at the required arc as the turbine blades are fed between the cutters. The feeding movement of this fixture is obtained by the engagement of a power-driven worm with a long worm segment attached to the under side of the movable member of the work fixture. The operation is completely automatic, except for reloading.

The fabricating shops of this shipyard, like those of most other shipbuilders, are fitted with heavy punching machines of the type shown in Fig. 2 for producing the numerous rivet holes required in hull and bulkhead plates, etc. The machine illustrated was built by the Cleveland Punch & Shear Works. As in customary shipyard procedure, this machine is equipped with

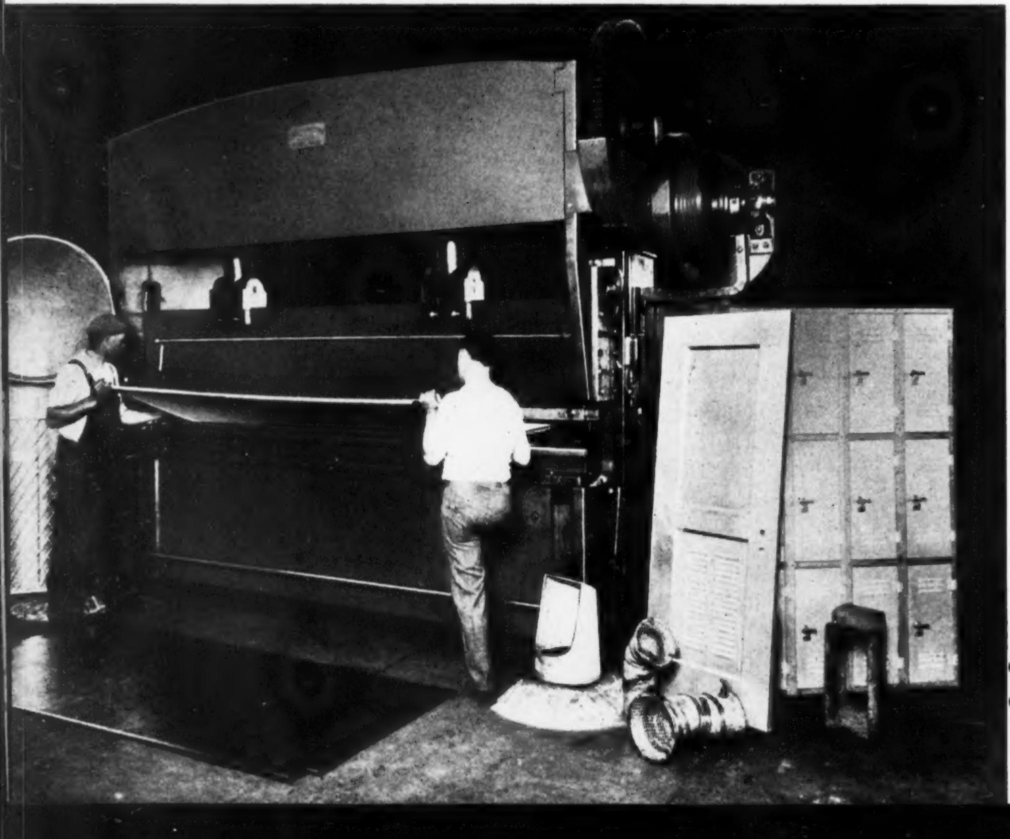


Fig. 18. Press Brakes are Used for the Many Bending and Flanging Operations on Steel Sheets Used for Such Parts as Doors and Lockers

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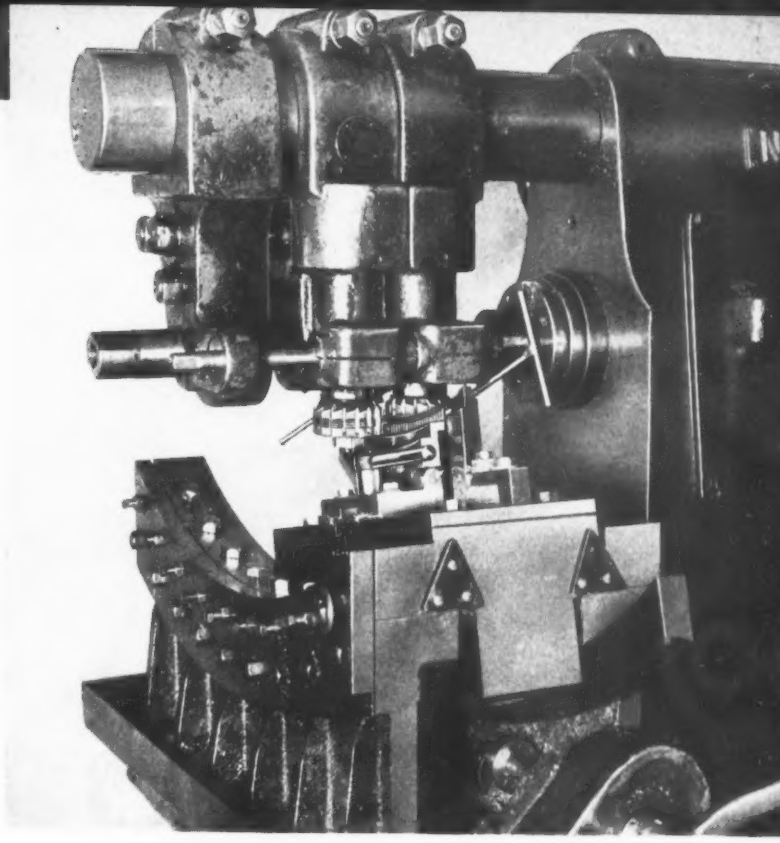


Fig. 19. Set-up Employed in Milling Serrations on Both Sides of High-pressure, Side-locking Turbine Rotor Blades

a long roller table, by means of which the steel plates can be quickly positioned beneath the punching tool in locations indicated by scribed lines and punch pricks.

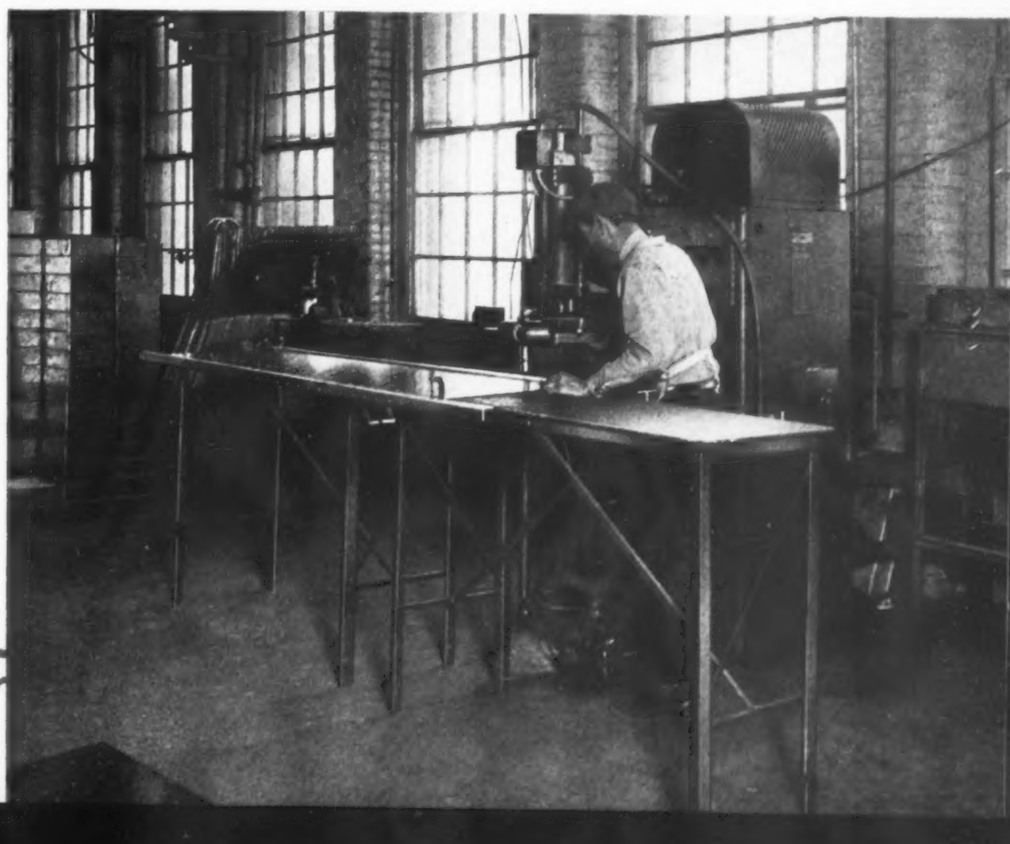
The entire table can be made to move in and out with respect to the punching tool by turning one of the large handwheels in the operator's station. By turning the other handwheel in this station, two sets of driven rollers near the middle of the table are actuated to move the steel plate longitudinally as required. The remaining sets of rollers are idlers, and revolve freely with the moving plate. At the front of the table are handwheels for raising or lowering the two rows of driven rollers in the center of the table. The over-all length of the table illustrated is approximately 100 feet.

The Dreis & Krump press brake shown in Fig. 18 is typical of the machines used for many bending and flanging operations on steel sheets required in manufacturing a considerable variety of work, such as the door and lockers seen on the right-hand side of the brake. Steel dies and punches that extend the length of the brake are employed in these operations, enabling the full capacity of the machine to be used.

In the construction of naval and merchant ships today, electric arc-welding is used instead of riveting in about 85 per cent of the jobs requiring such operations. Fig. 17 shows an operation of this classification being performed in making large king posts for the derricks of cargo vessels. These king posts, which are about 80 feet high, are constructed of two steel plates, rolled into cylinders and welded along the adjoining edges. In the illustration the outer cylinder of a king post is seen being tack-welded by the electric arc method, the king post at the left having been completely welded.

Spot-welding is also applied in the fabrication of parts which are not subjected to heavy loads. In Fig. 20 a Thomson-Gibb spot-welding machine is being used, for example, in an operation on a stowage panel. The upper electrode of the machine is actuated vertically by an air cylinder. Aluminum, stainless-steel, and Monel-metal parts are handled with this equipment. It has a rating of 150 kilovolt-amperes.

Fig. 20. Spot-welding is Performed on a Large Number of Aluminum, Stainless-steel and Monel-metal Parts that do not Carry Heavy Loads



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Cramp's Shipyard Renews

A Shipyard whose Naval Vessels have Won High Distinction in the Mexican, Civil, Spanish-American, and World Wars Now Builds to Meet the Present National Emergency

By CHARLES O. HERB

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Permission of the "Philadelphia Inquirer"

Its Historic Past ★

MORE than one hundred years ago—in 1830 to be exact—a young shipwright named William Cramp established in Philadelphia a shipyard that was destined to become famous throughout the seven seas and to contribute greatly toward making the Delaware River "the Clyde of America." When this shipyard was founded, the youthful United States was at peace, and Cramp visualized a long era of building wooden clippers and windjammers to meet the needs of commerce. In the century that followed, the Cramp Shipyard turned out hundreds of cargo-carrying ships, but it also built many war vessels that won respect for our Navy on the high seas.

When war broke out with Mexico, this shipyard built sturdy surfboats that served as transports for General Scott's army at Vera Cruz; for the Civil War, it turned out "Ironclads" that helped to defeat the Confederate Navy; and in the Spanish-American War, Cramp-built warships took a very prominent part—at the Battle of Santiago Bay, for example, the battleships *Indiana*, *Iowa*, and *Massachusetts*, and the cruisers *New York* and *Brooklyn*, were all Cramp built. The Cramp-built cruiser *Baltimore* was in Dewey's squadron that destroyed the Spanish fleet in Manila Bay. Fifty-odd destroyers were turned out in this shipyard for the World War.

With such a distinguished history, it was a matter of deep regret in naval and shipbuilding circles that financial conditions made it necessary for this shipyard to suspend operations in 1927. Practically all the machinery was sold and the yard lay completely idle until about eleven months ago, when, reorganized under the name of the Cramp Shipbuilding Co., it again commenced building vessels for national defense.

The entire yard has been replanned for the construction of ships with an uninterrupted flow of materials from raw storage to shipways. Entirely new machine tools and other metal-working machines have been installed in the fabricating, turret, machine, pipe, and sheet-metal shops. At the present time, the yard is busily engaged in constructing cruisers and floating work-shops for the Navy, as well as in repairing vessels. Typical operations in the revitalized Cramp Shipyard will be described in the following.

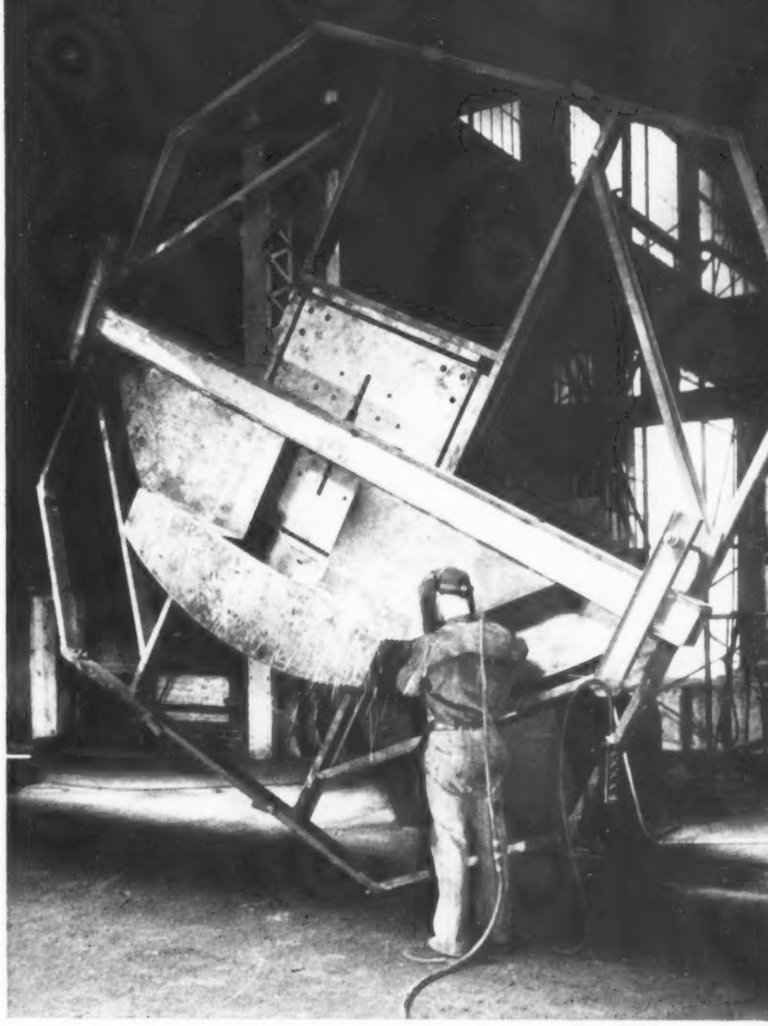

Fig. 1. Welding Positioner, which is Employed in the Fabrication of Steel Structures Weighing as Much as 10 Tons

Keel plates are bent to the same or changing degrees of angularity by means of the Southwark 1700-ton hydraulic press shown in Fig. 2. Plates of gun steel up to 22 feet long and as thick as 1 1/2 inches can be bent to the required form with one downward movement of the long punch. The punching member can be made to descend with its nose parallel to the floor anvils or at any angle that may be required to bend plates to a changing degree of angularity from end to end.

For example, it may be necessary to bend a

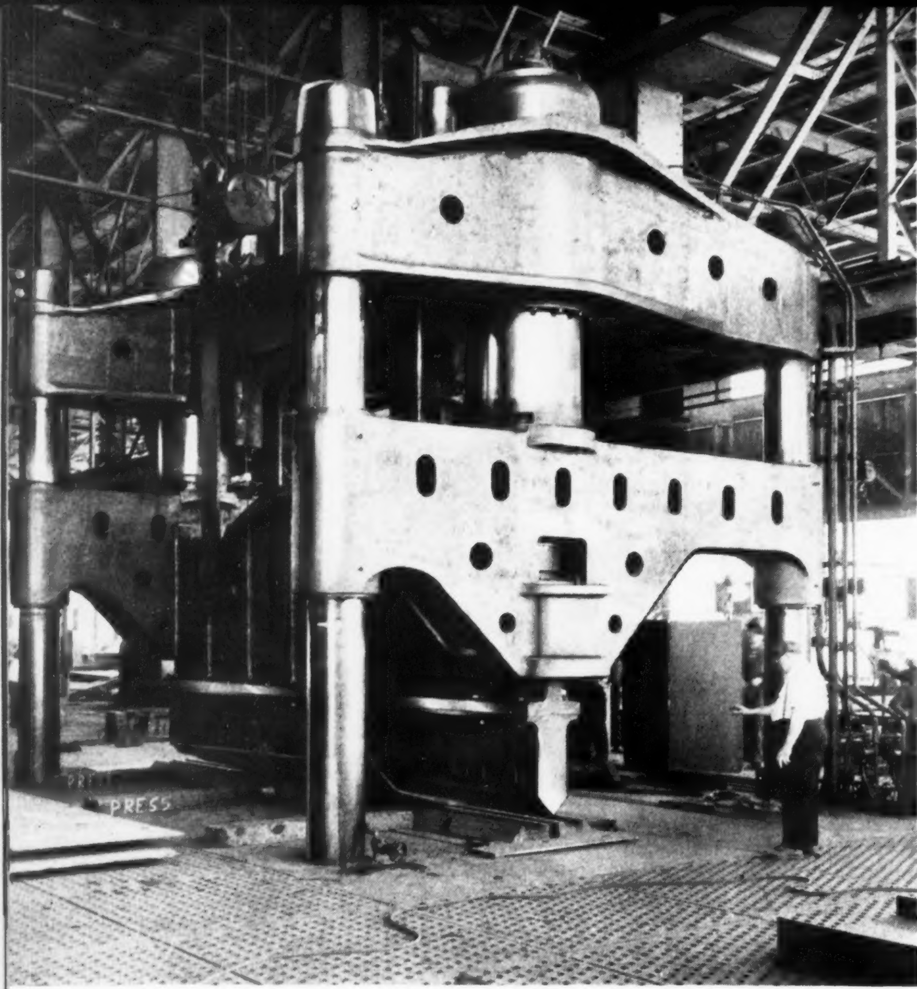

Fig. 2. Huge Hydraulic Press which is Used for Bending the Edges of Keel Plates to One Angle for the Full Length or to Various Angles

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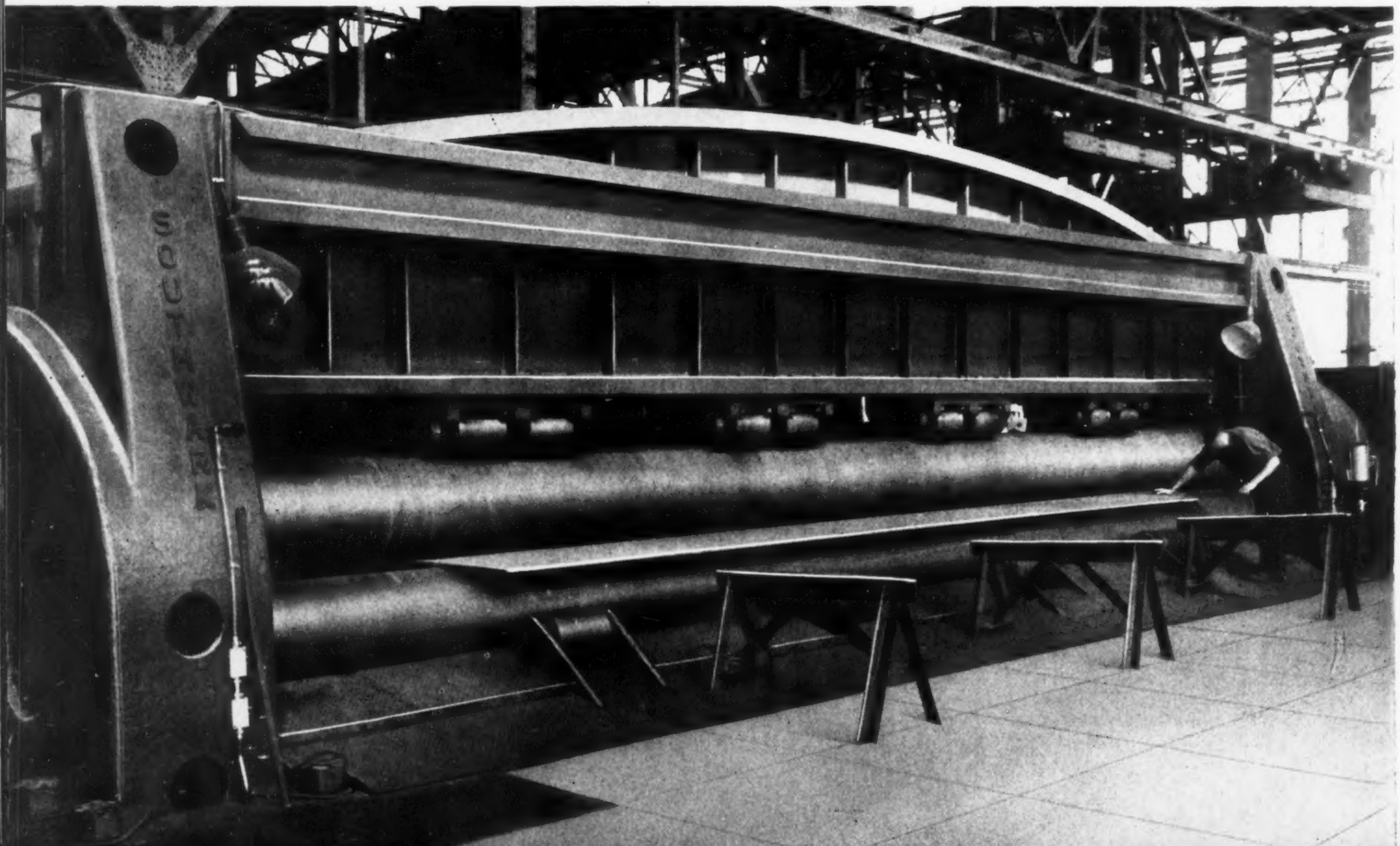
Fig. 3. (Below) Large Roll Bender which is Employed for Handling Plates up to 30 Feet in Length by 1 Inch in Thickness

plate upward at one end to an angle of 3 degrees and at the other end to an angle as great as 45 degrees. The nose of the punch can be tilted 15 degrees with respect to the floor anvils. This is accomplished by the operation of two secondary hydraulic cylinders located above each end of the ram. The upward and downward ram movements are effected by the main cylinders seen in the illustration at the opposite ends of the housings.

In an operation, the keel plates are bent to wooden templets such as seen being applied in Fig. 4 for the inspection of a plate that has already been bent. It will be observed that the ram of this press is located closer to the two columns seen at the left in Fig. 2 than to the



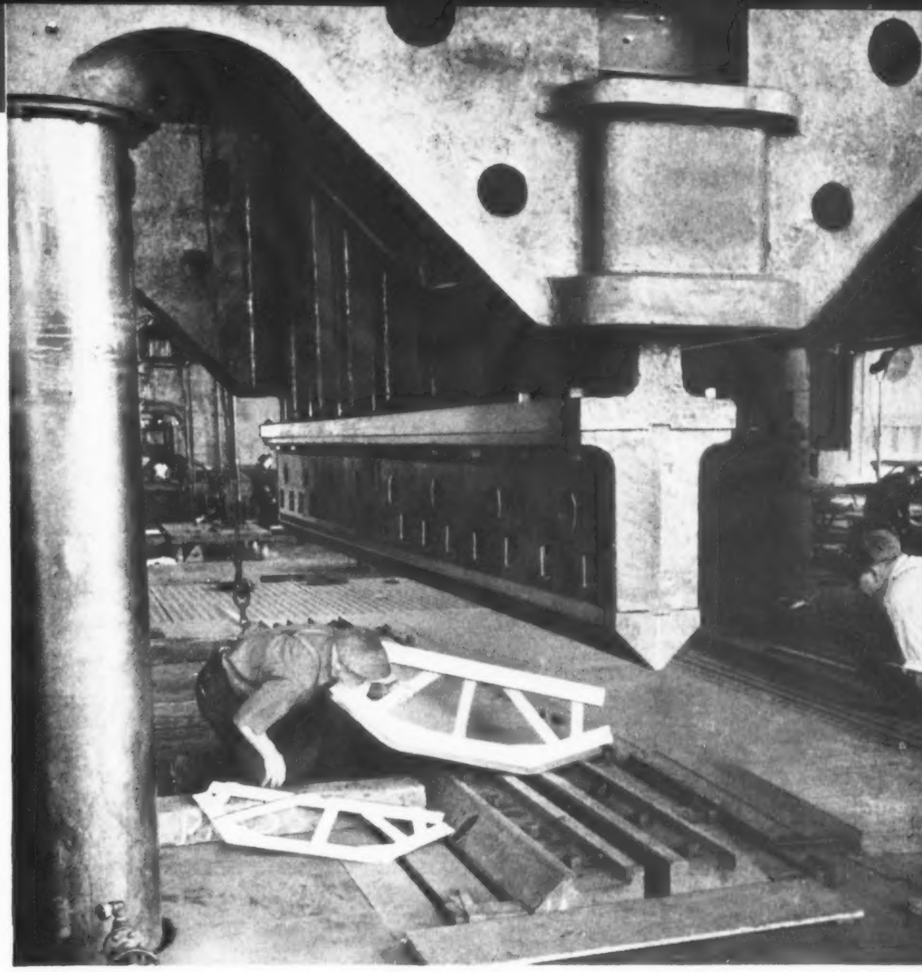


Fig. 4. Close-up View of Keel Bender, Showing Construction of Long Punch and Manner of Applying Wooden Templets for Checking Finished Work

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Fig. 5. (Below) Battery of Arc Welders Adjacent to Booths in which Apprentices are Taught the Art of Welding

two columns on the opposite side of the press. This arrangement enables larger plates to be handled than would be possible if the ram were equidistant between the columns, in view of the fact that the bends are made near the edges of the keel plates. Plates up to 12 feet wide can be handled with this huge hydraulic press.

Included in the equipment of the fabrication shop are the huge Southwark rolls seen in Fig. 3, which have a capacity for bending hull plates up to 30 feet long by 1 inch thick. The plates are bent between two horizontal rolls which revolve on parallel axes and an upper horizontal roll that is adjustable by means of hydraulic cylinders at the two ends of the machine. Bends of various radii can be made on plates of dif-

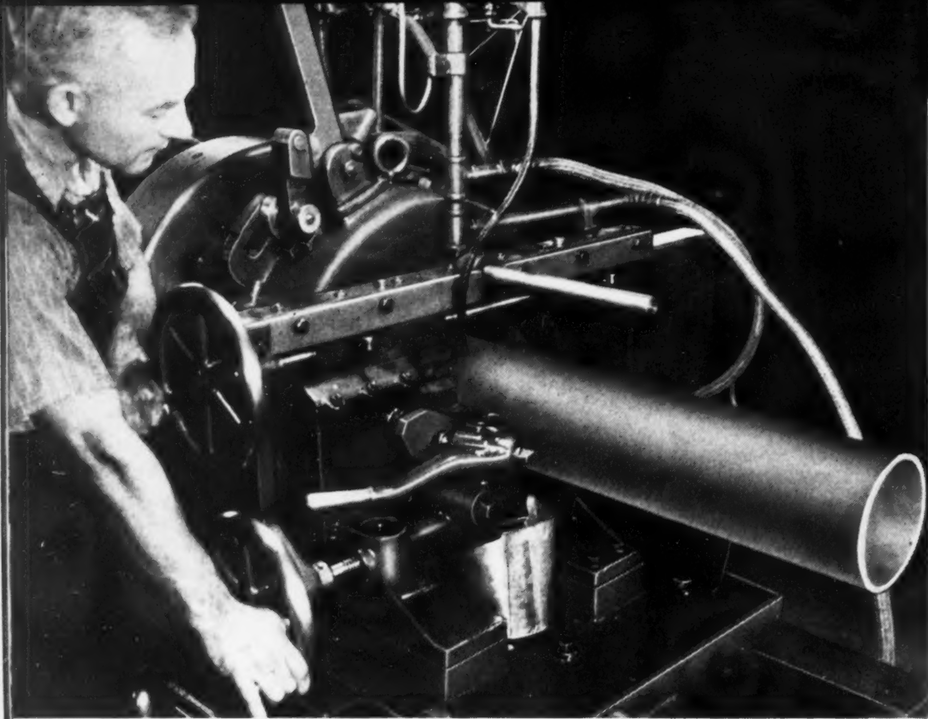

Fig. 6. Cutting-off and Reaming Side of Carriage on Machine Shown in Fig. 7, which also Carries the Die-head

ferent thicknesses by adjusting the upper roll vertically as required. Also, by adjusting this roll to different heights at the opposite ends, plates can be rolled to a given radius at one end and to another radius at the opposite end. Large dials on the front of the machine indicate the proper settings of the upper roll for bending to desired radii.

One of the features of these rolls is the provision for making right-angle bends near the edges of plates. This is accomplished by inserting the edge of the plate to be bent in a slot that extends the length of each bottom roll, so that the plate is fed downward between the two bottom rolls when the plate is pulled into the machine rather than horizontally through the machine between the bottom and top rolls.

From the illustration it will be seen that the top of the upper roll is backed up by four sets of horizontal rollers consisting of four rollers each. Likewise, four sets of backing up rollers are provided for each of the two bottom rolls. In each set, there is a backing-up roller on both the front and rear sides of the large roller. Other equipment in the plate fabricating shop consists of punching machines, shears, plate planers, etc., of modern design, which are applied according to conventional practice in shipbuilding yards.

One of the striking machines in the turret shop is the large welding positioner illustrated in Fig. 1, which has been used in the production of weldments weighing as much as 10 tons. The work-table can be placed in any position from the horizontal through 135 degrees to enable plates and other sections to be welded both on the top and bottom sides with the joints in a horizontal plane. As the table can be tilted more than 90 degrees and the front side of the positioner frame is inclined, the work can be welded

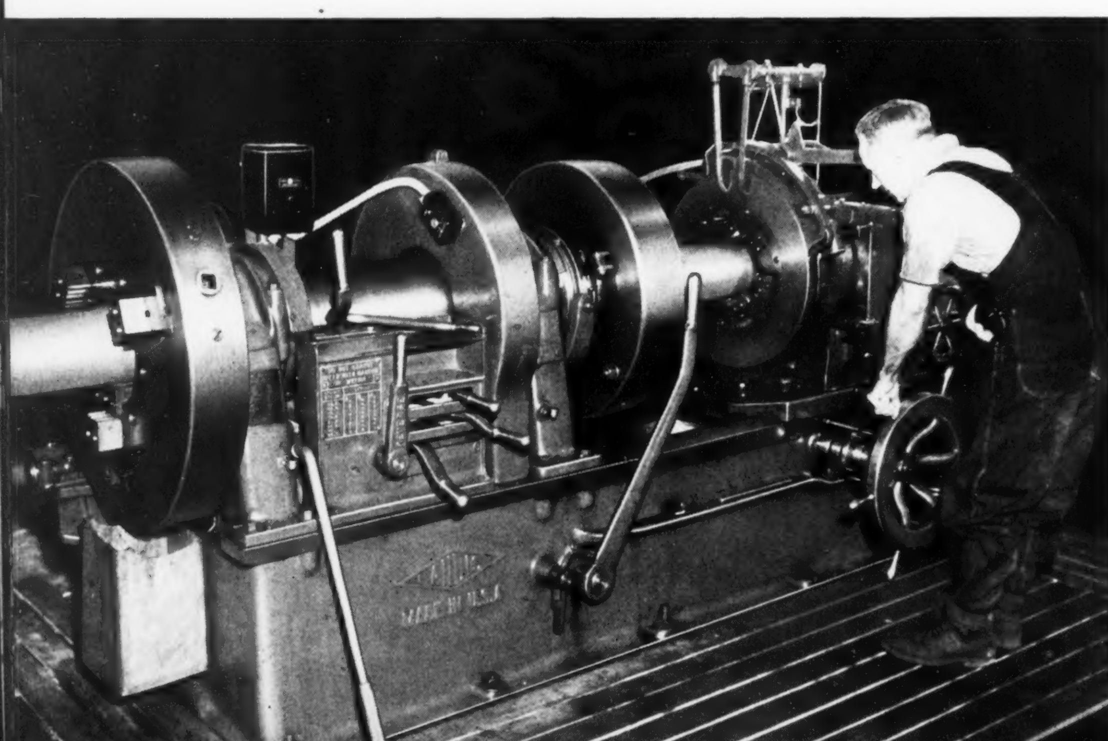

Fig. 7. Pipe Threading and Cutting Machine Engaged in Cutting the Threads on a 6-inch Pipe

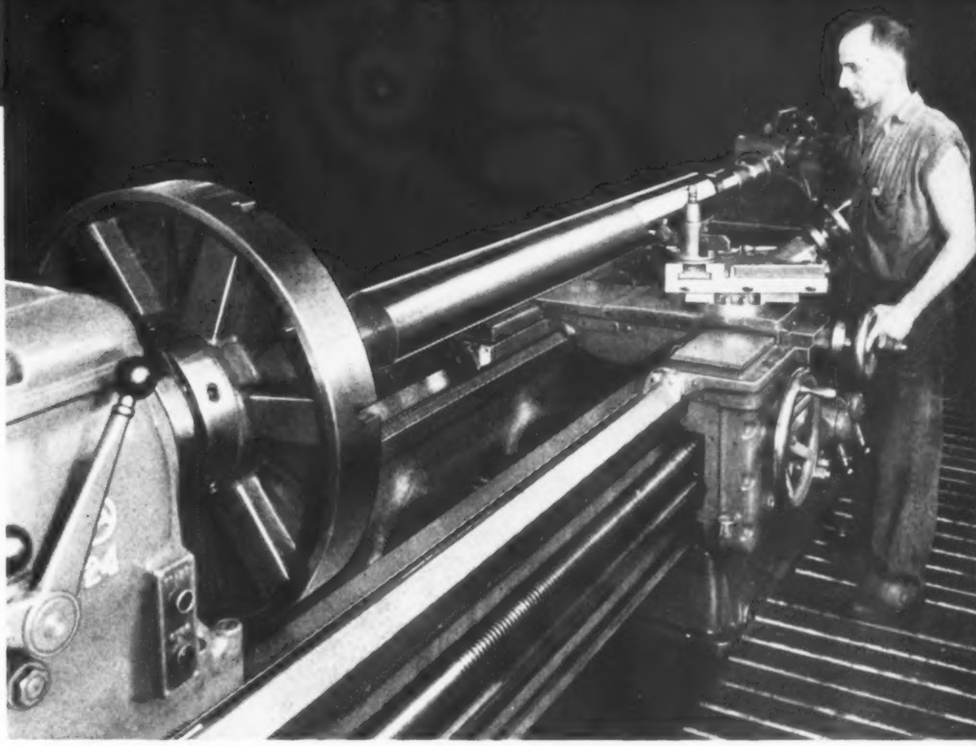

Fig. 8. Turning a Long Piston-rod in a Heavy-duty Lathe that Takes Work up to 12 Feet Long between Centers

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on the under side of the structure with only one setting on the table.

When the table is horizontal, its face is 8 feet 6 inches above the floor. The width across the corners of the frame that surrounds the table is 12 feet. In addition to the tilting provision, the table can be revolved 360 degrees on its central trunnion. Separate motors of 7 1/2 and 5 H.P., respectively, are provided for the tilting and rotating functions of the table. This welding positioner was built by the United Engineering & Foundry Co. An even larger positioner that will accommodate weldments weighing up to 23 tons will soon be installed.

One of the larger machines in the pipe shop is the Landis pipe threading and cutting machine shown in Fig. 7. At the time that the photograph was taken, this machine was engaged in cutting the thread on a 6-inch pipe for a fuel-oil suction line required on board ship. The machine is equipped for handling pipe from 2 1/2 inches to the size shown.

In cutting threads, the pipe is gripped firmly and rotated by means of the chucks at the front and back ends of the headstock. The threads are cut by a die-head on a carriage at the right-hand end of the machine which is fed toward the work. In Fig. 6 is shown the opposite side of the die-head carriage, which is equipped for cutting off pipe to the required lengths and "reaming" the ends of pipe on the inside to a bevel. For the cutting-off operation, use is made of a tool on a slide that is fed horizontally toward the pipe, while in reaming, the tool in front of the cutting-off tool is used, the reaming tool being mounted on a lever that can be swung forward to bring the tool in contact with the end of the pipe. In both cutting-off and reaming, the pipe is rotated by the same chucks as are employed in threading.

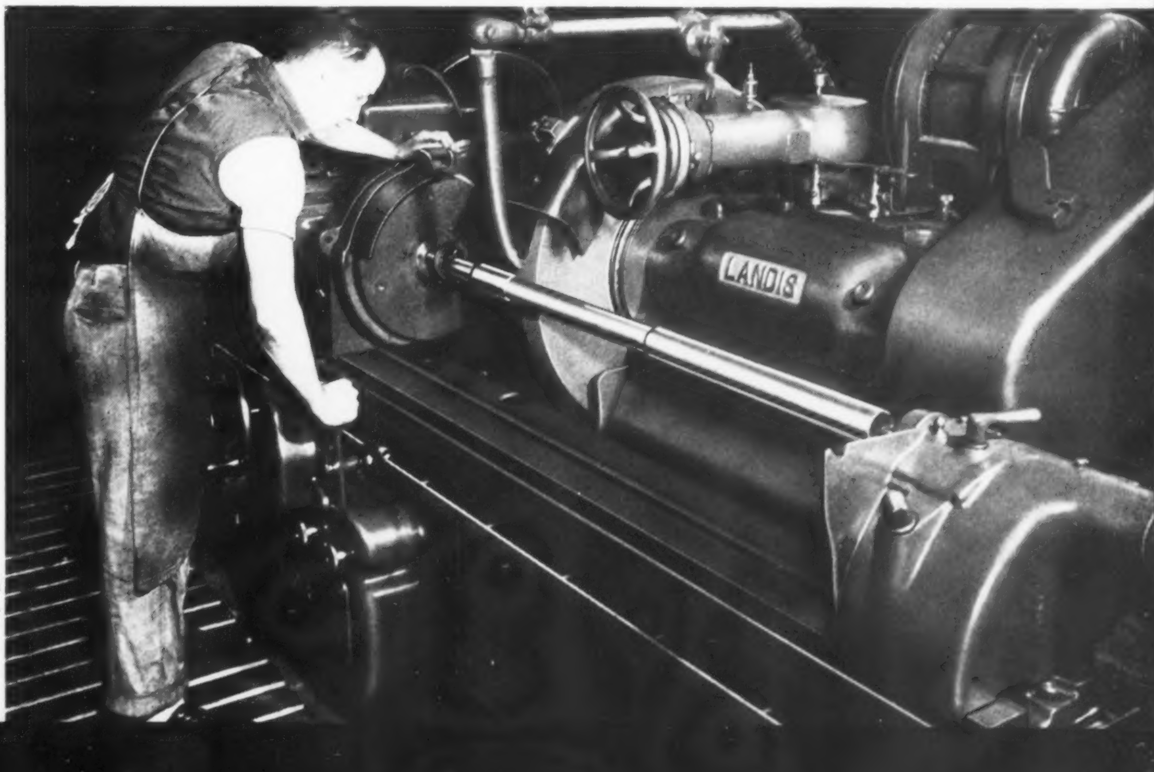

Fig. 9. Cylindrical Grinding Machine Employed for a Variety of Work Required in Ship Construction

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Fig. 10. Threading and Cutting Nipples on a Machine that has a Capacity for Handling Pipe Ranging from 1/8 Inch to 2 Inches

Adjacent to this large pipe threading and cutting machine is the smaller Oster Rapiduction Junior machine illustrated in Fig. 10, which has a capacity for pipe from 1/8 inch to 2 inches. The illustration shows this machine threading one end of nipples, the unthreaded end of which is later welded to steel plates. The cutting-off tool may be seen in back of the die-head. This machine is also equipped with a conical reaming tool mounted on a holder that can be moved along the rear cylindrical bar on which the die-head carriage slides. The reamer can be applied to the end of a pipe, after the die-head has been withdrawn to the end of the machine opposite the headstock, by swinging the reamer into line with the center of the pipe and then pushing it against the end of the pipe.

Bolts from 1/2 inch to 2 inches in diameter can be threaded by means of the Acme machine illustrated in Fig. 12, which is shown engaged in cutting the threads of studs 1 1/2 inches in diameter by 12 inches long. These studs are intended for use as foundation bolts in the installation of new machines throughout the various shops. Threads are cut on one end of these studs for a length of about 5 inches. The same machine is used for a large variety of smaller parts, such as studs for valves, inspection plates, manholes, and so on.

An Axelson heavy-duty lathe installed in the "inside" machine shop is shown in Fig. 8 being employed for turning a piston-rod required in the repair of a merchant vessel. The piston-rod is 8 feet 6 inches long by 7 inches in diameter. This engine lathe, which has a swing of 24 inches and takes work up to 12 feet long between centers, is also used on new ship work for turning and boring such parts as fairweathers, rope guards, liners, bushings, and valve bodies. The machine is equipped with a regular taper attachment.

The Landis cylindrical grinding machine seen in Fig. 9 is used principally in grinding rollers 7 inches in diameter by 9 inches in length. In the illustration, however, a boring-bar is being ground in typical tool-room manner. The machine has a swing of 16 inches, and accommo-

Fig. 11. Hydraulic Radial Drilling Machine being Used for Drilling Holes in an Inspection Plate

Fig. 12. Cutting a Thread for a Length of Approximately 5 Inches on Foundation Bolts that are 1 1/2 Inches in Diameter by 12 Inches Long

dates work up to 72 inches long between centers. The grinding wheel is 24 inches in diameter by 3 inches face width.

The hydraulic features of the Fosdick radial drilling machine shown in Fig. 11 are proving advantageous in performing the varied operations that come up in the machine shop of a shipyard. In the illustration, this machine is being used for drilling 1 1/4-inch diameter holes through an inspection plate. Thirty-six spindle speeds are obtainable through a hydraulic gear-shifting mechanism; the head can be traversed hydraulically along the arm at variable rates; the arm is raised and lowered hydraulically; and the outer column is clamped to the inner column by hydraulic means. The machine is provided with a 5-foot arm, and has a column 15 inches in diameter.

The Wiedemann turret type punching machine shown in Fig. 13 is provided with both round and square punches to meet the varied demands of the sheet-metal shop. All together there are eighteen punches on the turret. The square punches range in size from 1 by 1 inch to 2 1/2 by 2 1/2 inches, and the round punches from 1 3/8 to 4 inches in diameter. This machine is used for such purposes as cutting lightening holes in sheets and sockets for battens. Long slots can be cut by merely shifting the material sidewise by amounts slightly less than the width of the square punches between successive operations of the punching member. Guide bars at the back of the table, against which one end of the sheet is held, insure alignment of the holes.

An apprentice course has been established in this shipyard to provide the many skilled mechanics which, it is expected, will be required in the years to come. The first thing that some of the boys are taught is to become adept welders. In Fig. 5 are seen five welding booths, in which the apprentices receive instruction. The booths are equipped with Lincoln 200-ampere welders and with counterweighted work-holding fixtures that enable weldments to be positioned in any desired plane for the performance of horizontal, vertical, and overhead welding.

Fig. 13. Turret Punching Machine with Eighteen Punches, Some Round and Others Square

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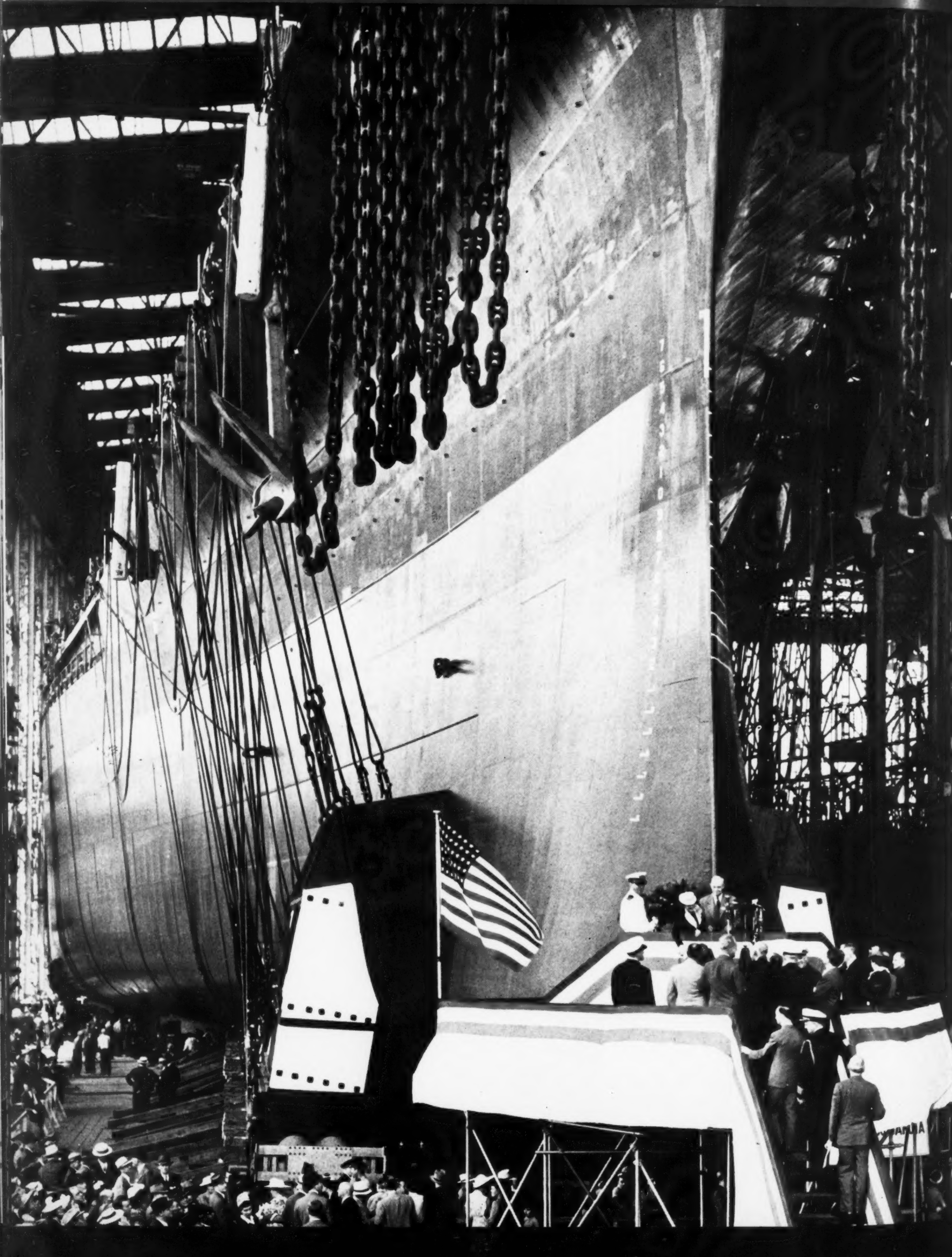
"New York Shipbuilding"



Concentrates on Cruisers

UNCLE SAM'S two-ocean Navy will have a huge armada of modern cruisers. Many vessels of this type are being built by the New York Shipbuilding Corporation, Camden, N. J., which concern is also rushing completion on a battleship.

The concern mentioned, which is one of the "Big Three" in shipbuilding, was established in 1899. It immediately aroused widespread interest in shipbuilding circles the world over, due to the uniqueness of its plant. The plant was laid out upon principles that were considered more or less radical forty-odd years ago. These principles were: First, the general application of templets to the fabrication of steel shapes and plates in order to produce a better structure and to reduce the cost; second, the routing of material through the shipyard in an uninterrupted course from the time of its receipt in the raw state to its assembly in finished shape on the ship; third, the use of overhead traveling cranes in every part of the yard and buildings where material was to be stored or handled; fourth, the housing of shops and shipways under a continuous roof structure, so that all work could be carried on regardless of weather conditions; fifth, the installation of propelling machinery and heavy weights in a vessel before launching, thus permitting many vessels to be 90 per cent complete before they were launched.

That these five principles embodied in the yard forty years ago were sound has been proved by the fact that they have been used throughout this period, during which the shop has been increased tremendously in size, and have also been adopted by shipbuilders all over the world as standard practice.

During the last year or two this shipyard, in common with the other yards that have enjoyed a return to prosperity due to orders received from the Navy Department and the Maritime Commission, has expended huge sums of money in bringing its manufacturing facilities up to date and in greatly enlarging its capacity. Some of the methods employed in the machining and metal-fabricating departments will be described.

Milling the keyways in propeller shafts on the tapered section to which the propeller is assembled is an operation of utmost importance, because of the close registry that the propeller must have with its shaft. Not only must the keyways be held to unusually close limits as to width, but they must also be 180 degrees apart as exactly as it is possible to machine them. Their relative location must meet the rigid requirements of a sleeve gage.

The propeller-shaft keyways are milled to these requirements by means of the Giddings & Lewis portable boring, drilling, and milling machine shown in Fig. 1. The propeller shaft is first clamped in large V-blocks on a floor plate, and the boring mill is then brought up to the shaft and lined up parallel with the tapered surface in which the keyway is to be cut. Accurate alignment is obtained by mounting a dial

Fig. 1. Milling Keyways in a Large Propeller Shaft by the Application of a Portable Boring, Drilling and Milling Machine

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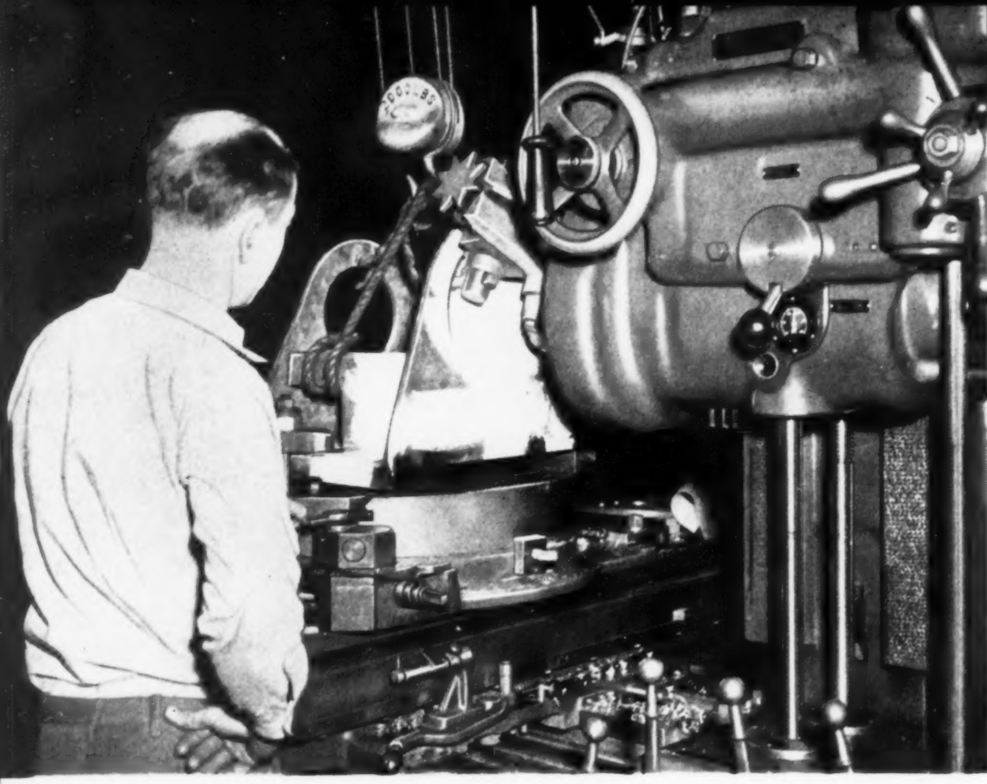

Fig. 2. Applying a Horizontal Boring, Drilling, and Milling Machine for Drilling Holes in Two Extensions of a Welded Steel Bracket

indicator on the spindle of the boring mill and feeding the indicator along the tapered surface by moving the machine column along its bed, the bed being shifted until it is parallel with the tapered work surface.

In producing each keyway, a rough cut is taken with a helical end-mill that is approximately the full width of the keyway. Then another end-mill is used to finish the keyway all around, only one side being machined at a time. The keyways are cut slightly tapered.

A Universal boring, drilling, and milling machine is shown in Fig. 2 being used for cutting two circular holes in a steel fabricated bracket for the steering gear of a vessel. At the time that the photograph was taken one of the holes had already been cut and the machine was engaged in producing the second hole in a steel plate extension on the opposite end of the part. The cut is shown being taken by a tool mounted on a slide that is adjustable radially on an arm to obtain any desired cutting radius. In this operation, the tool-head is fed toward the work for cutting through the comparatively thin plate. The work is mounted on a circular table which provides for indexing either side of the work toward the machine spindle.

When the second hole has been cut in the part, a boring-bar is placed in the machine for finishing the two openings closely to the specified diameter and within accurate alignment.

A huge horizontal boring, drilling, and milling machine with an 8-inch diameter spindle is shown in Fig. 3 engaged in a typical milling operation on a deck lug foundation. A face-milling cut is being taken across a fairly large

Fig. 3. Face-milling a Fabricated Steel Structure on a Huge Boring Mill that is Provided with an 8-inch Diameter Spindle

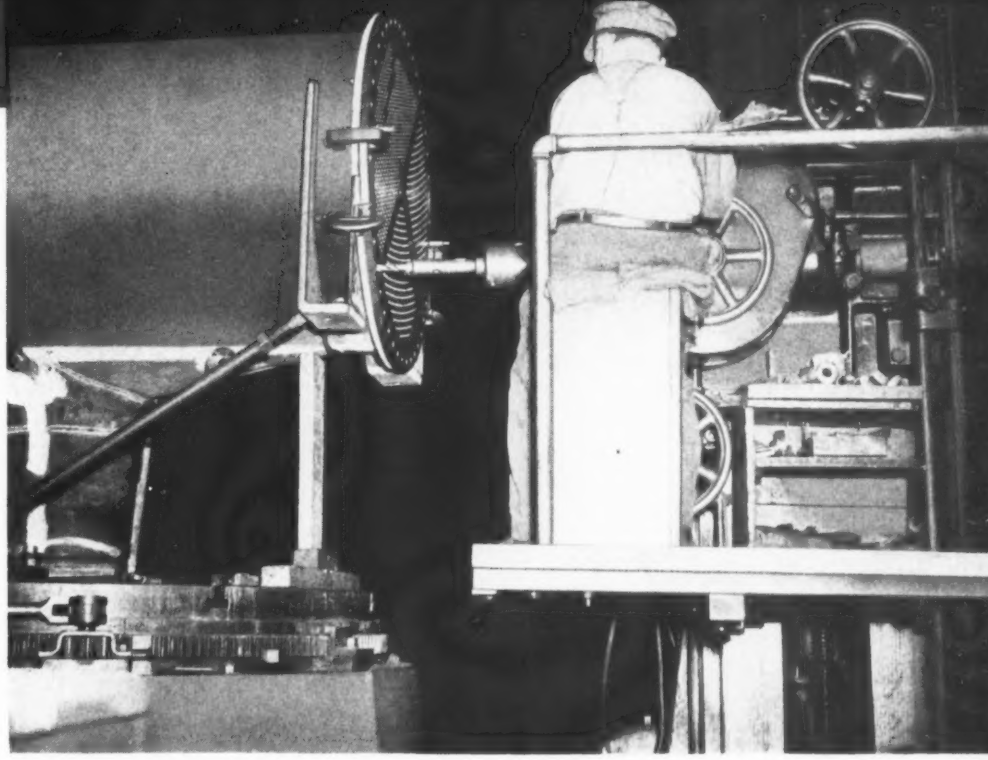

Fig. 4. Drilling Bolt-holes in the Flange of a Condenser Shell in Accordance with Holes Previously Drilled in the Tubesheet

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flat surface. Six of these fabricated steel units are required for each ship.

In Fig. 4 a condenser tubesheet is being used as a jig for drilling the bolt-holes in a condenser shell. These bolt-holes are later used in assembling the tubesheet to the shell. The operation is performed on a horizontal drilling machine, the column of which is adjustable horizontally along the bed and the drill head vertically on the column, thus enabling the drill to be located at any point around the tubesheet. The machine is equipped with an indexing work-table.

The use of a Cincinnati Gilbert radial drilling machine for producing a number of holes in armor deck plate or grating is illustrated in Fig. 5. The large number of holes seen in the grating were produced at the steel mill before the grating was bent to the large-angle V-shape shown, the operation illustrated consisting merely of drilling several holes to a diameter of about 2 inches along the center of the vee. The drilling of armor plate is an operation that demands sharp tools and a sturdy machine.

Long keys are produced by planing in an operation such as that shown in Fig. 6 in progress on a Gray planer. The keys are from 8 to 10 feet long, and must be machined on all four sides, two sides flat and the other two sides with a curved depression or trough.

Equipment especially designed for machining lower roller tracks is shown in Fig. 7. This machine consists essentially of a revolving table, which is located under the work and carries a cross-rail extending radially outward as shown. On the cross-rail there is a tool-slide equipped with an adjustable vertical post that carries a

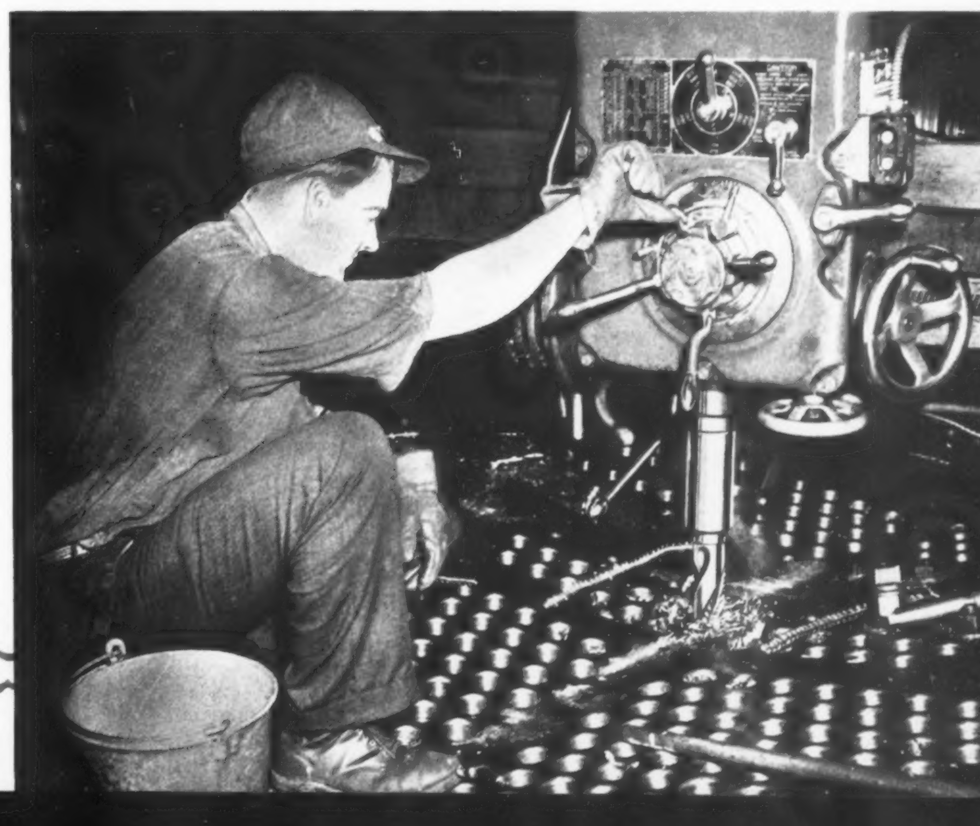

Fig. 5. Employing a Radial Drilling Machine for Drilling 2-inch Holes through the Center of Armor Deck Plate or Grating

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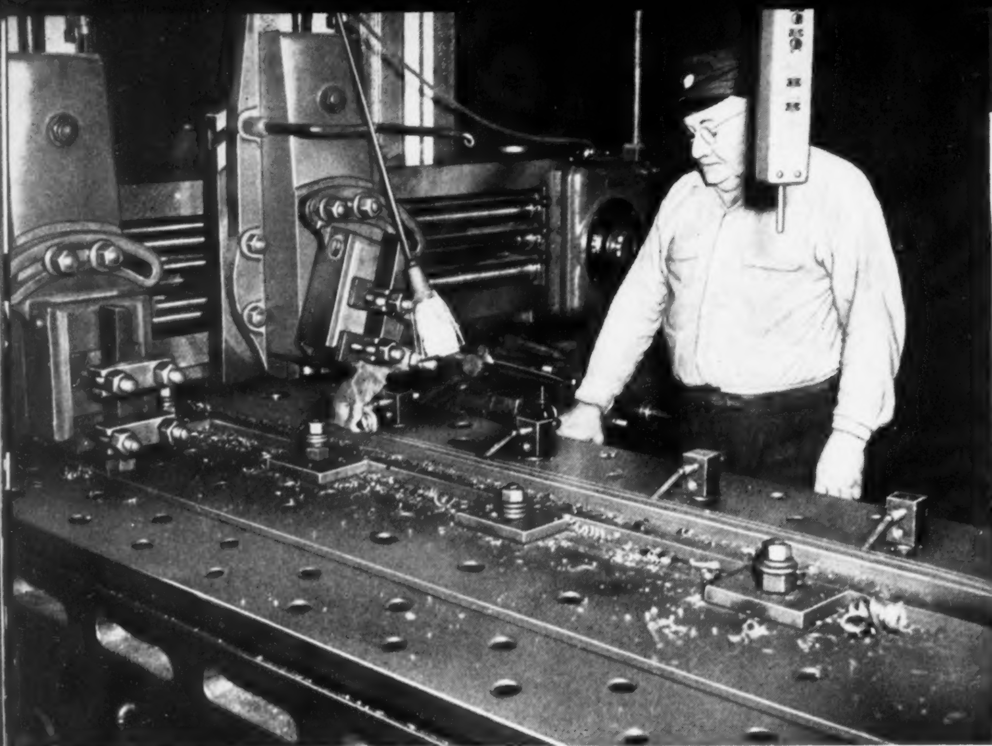

Fig. 6. Special Keys are Machined on the Flat and Curved Sides by This Planer within Close Tolerances

block for cutters at its upper end. By rotating the table about the center of the work, a tool can be carried completely around the work for taking turning, boring, and facing cuts. Surfaces up to 40 feet in diameter can be machined.

The Quickwork rotary shear shown in Fig. 8 provides a ready means of cutting out sheets of steel or other material to any required outline, either straight, circular or irregular, in the fabricating shops. In the illustration, a condenser head is being cut out of a sheet of copper-nickel steel. The machine has a capacity for cutting through mild steel up to 1/2 inch thick at speeds up to 30 feet per minute.

The Marvel universal tool-room sawing machine illustrated in Fig. 9 finds wide application in cutting bars, tubes, etc., either straight through cross-sectionally or at any desired angle up to 45 degrees. In the illustration, the saw frame is shown tilted for taking an angular cut on a piece of steel pipe. The machine will accommodate one or more pieces of stock up to 12 by 12 inches in cross-section.

In Fig. 10 is shown a National electric seam-welder engaged in welding a guard or shield for a transformer. The roller type electrode is mounted on a carriage that moves horizontally over the work to weld the long edges of the material together in a straight line. The roller electrode is approximately 10 inches in diameter, and has a stroke of 2 inches. It is moved back and forth over the work hydraulically.

A heavy-duty spot-welding machine built in the machine shop of the shipyard is shown in Fig. 12 welding together two sections of a ventilator duct. This machine is constructed with

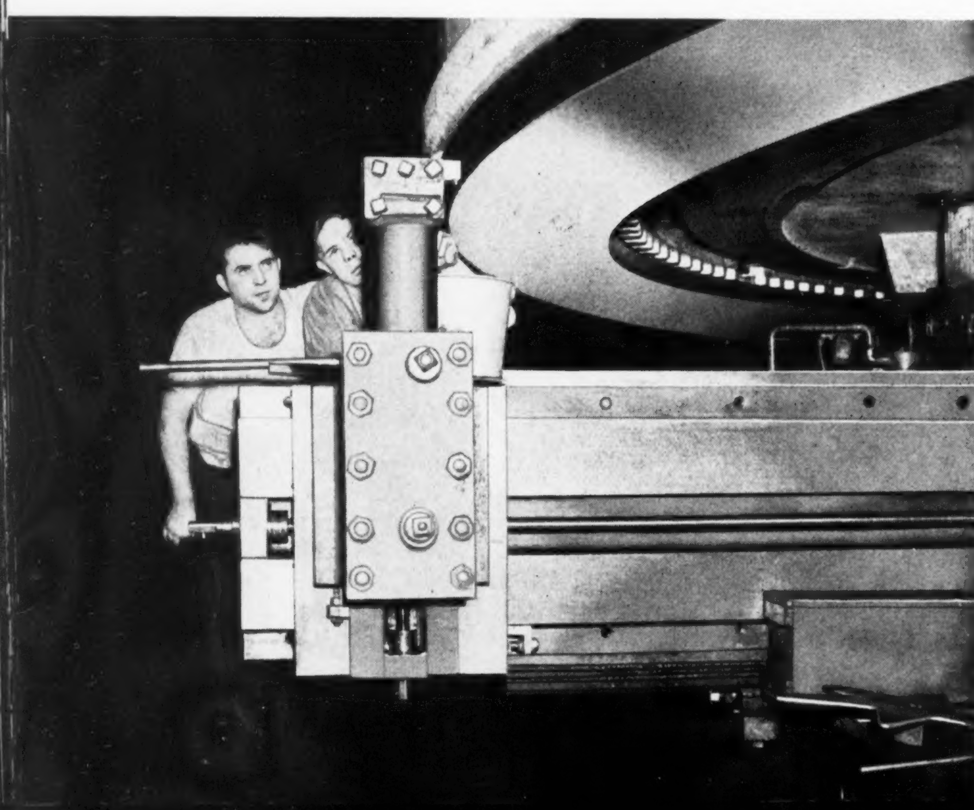

Fig. 7. Special Machine Devised for Taking Turning, Facing and Boring Cuts on Circular Work at Radii up to 20 Feet

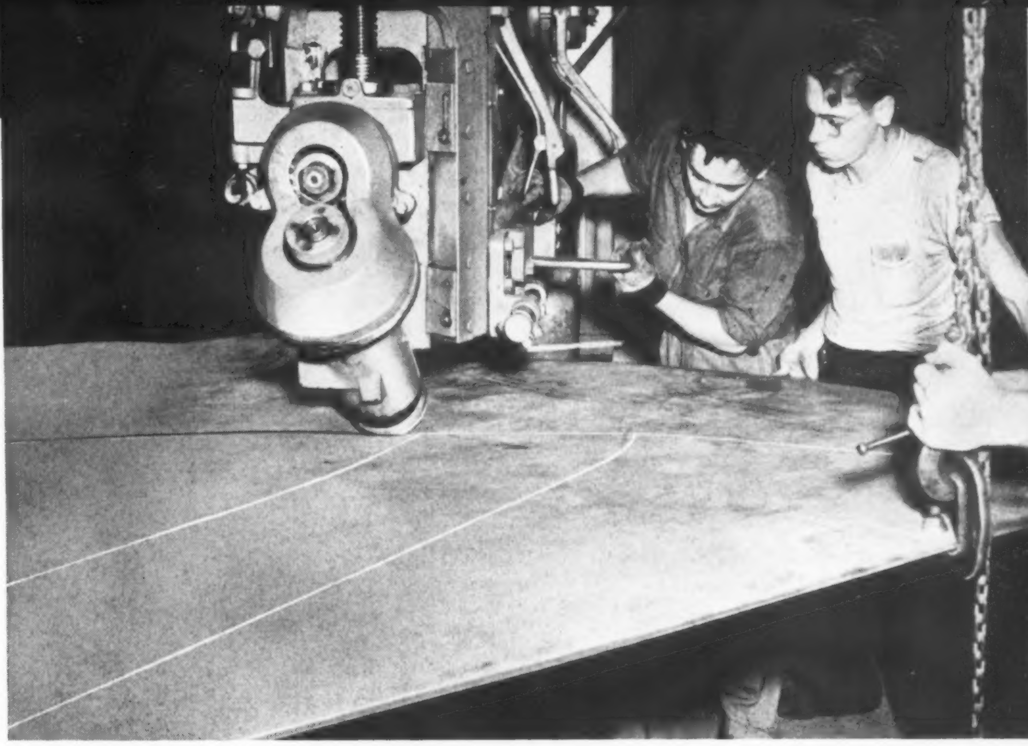

Fig. 8. Rotary Shear being Employed for Cutting a Condenser Head out of a Copper-nickel Steel Sheet

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an unusually long arm for supporting work of the character shown, and the electrode is mounted on the outer end of an adjustable bar.

Fig. 11 shows one of the newer engine lathes installed in the machine shop. This machine, which was built by the Monarch Machine Tool Co., has a swing of 24 inches. The particular job shown consists of machining an axle approximately 5 inches in diameter by 5 feet long for a yard maintenance job.

Straight flanging and other bending operations on sheets are performed on press brakes. Such an operation is seen being performed in Fig. 13 on a machine built by the Cincinnati Shaper Co. Most of the material handled on the press brakes is comparatively thin sheet aluminum or stainless steel.

One of the modern shears installed for handling the large volume of steel and aluminum sheets that must be cut to length is illustrated in Fig. 14. This power squaring shear, which was built by the Niagara Machine & Tool Works, handles sheets up to 15 feet wide and is used to cut mild steel up to 1/4 inch thick.

All castings subjected to heavy stresses, steam pressure, etc., are examined with the General Electric X-ray equipment shown in Fig. 15, in order to detect internal blow-holes or other flaws that are not visible. This X-ray equipment is also employed from time to time on steel fabricated structures to check the welds. It has a rating of 200 kilovolt-amperes, and is applied for the penetration of metal to a depth of about 2 inches. The X-ray equipment is installed in a room about 15 by 25 feet, which is completely insulated with sheet lead.

Fig. 9. Using a Sawing Machine of Modern Design for Cutting a Piece of Steel Pipe at an Angle

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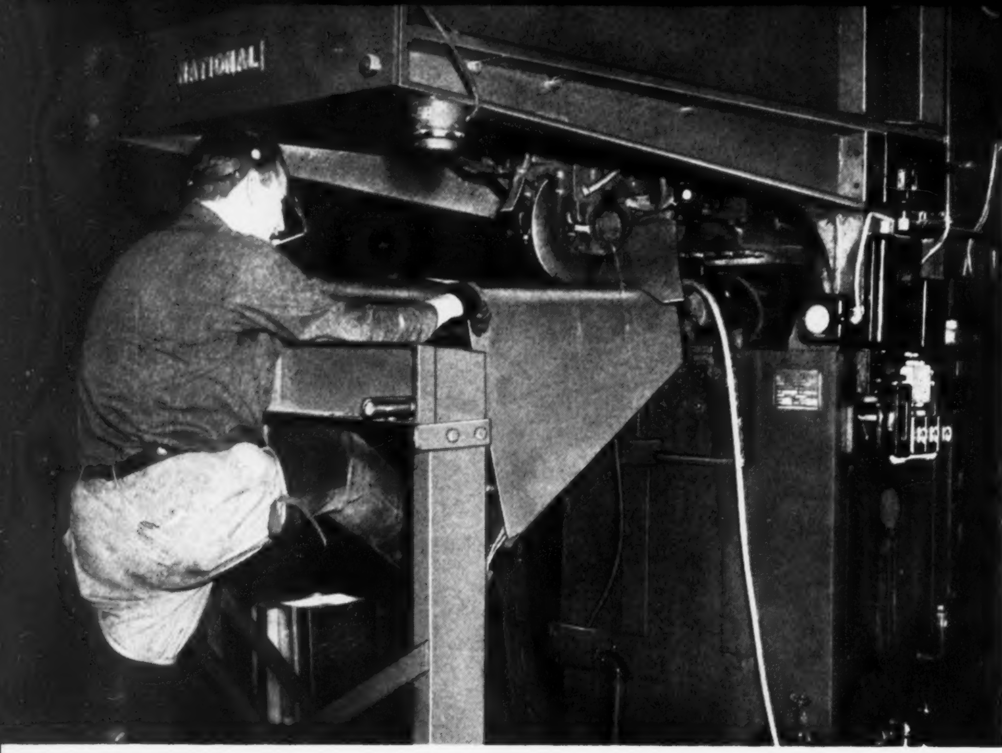

Fig. 10. Seam-welding Machine Provided with a Roller Electrode that is Moved Back and Forth over the Work by Hydraulic Means

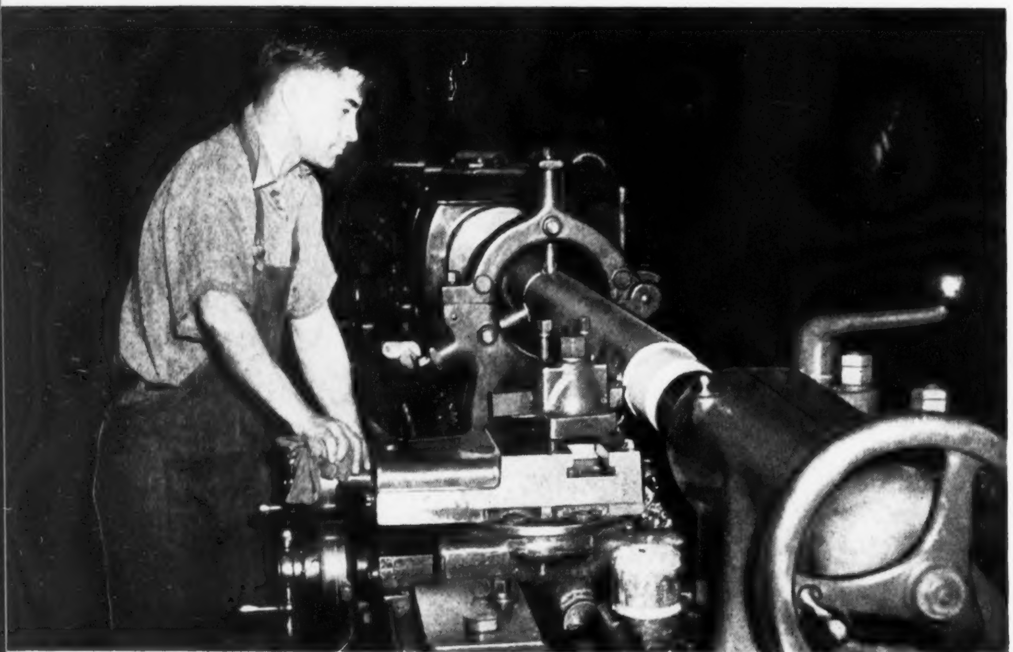

Fig. 11. Typical Turning Operation on One of the Modern Lathes Recently Installed in the Machine Shop of the Shipyard

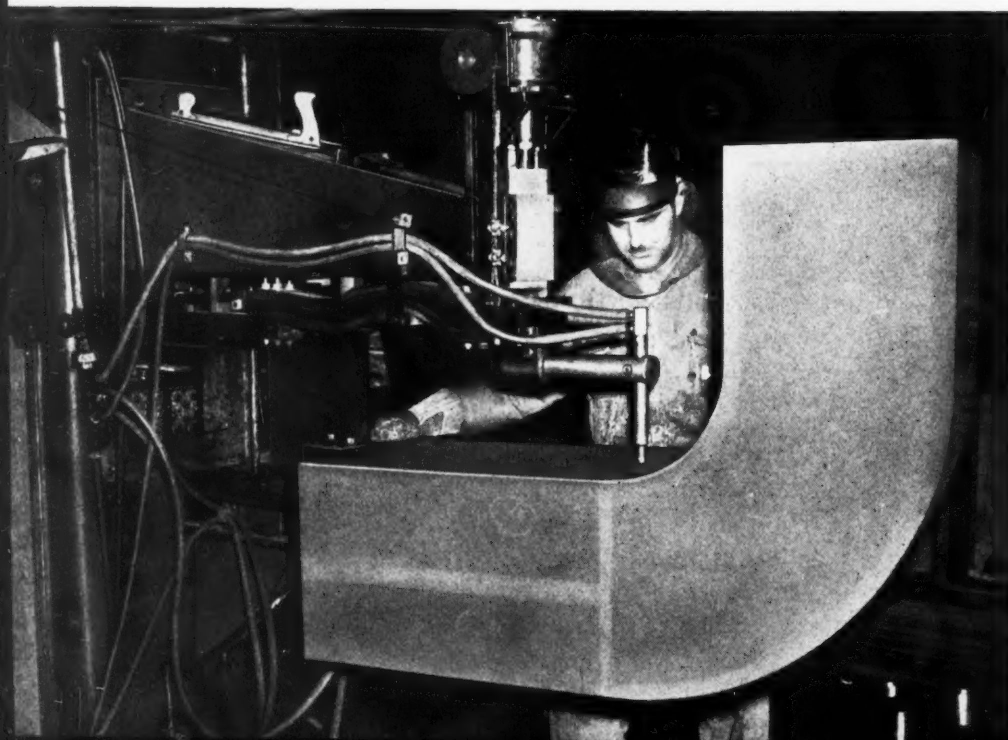

Fig. 12. Spot-welding Operation on a Ventilator Duct being Performed by a Machine of Special Design

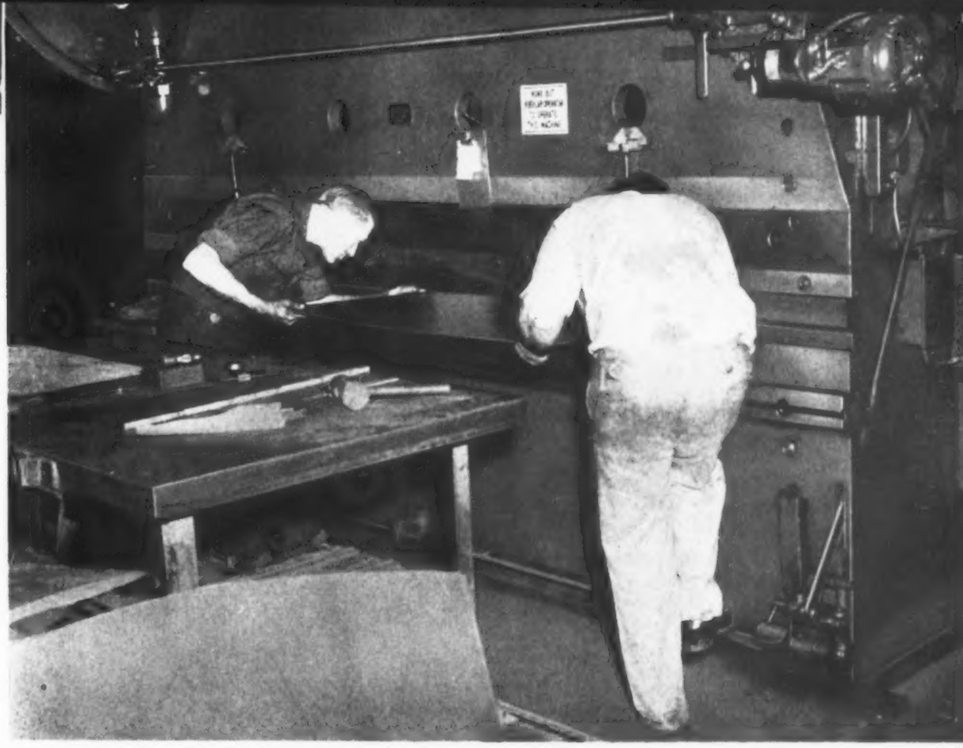

Fig. 13. Press Brakes are Widely Used in the "Tin Shop" for Bending and Flanging Sheets of Stainless Steel, Aluminum, and Ordinary Steel

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Fig. 14. Steel Sheets are Cut Accurately to Required Lengths by the Use of This Power Squaring Shear

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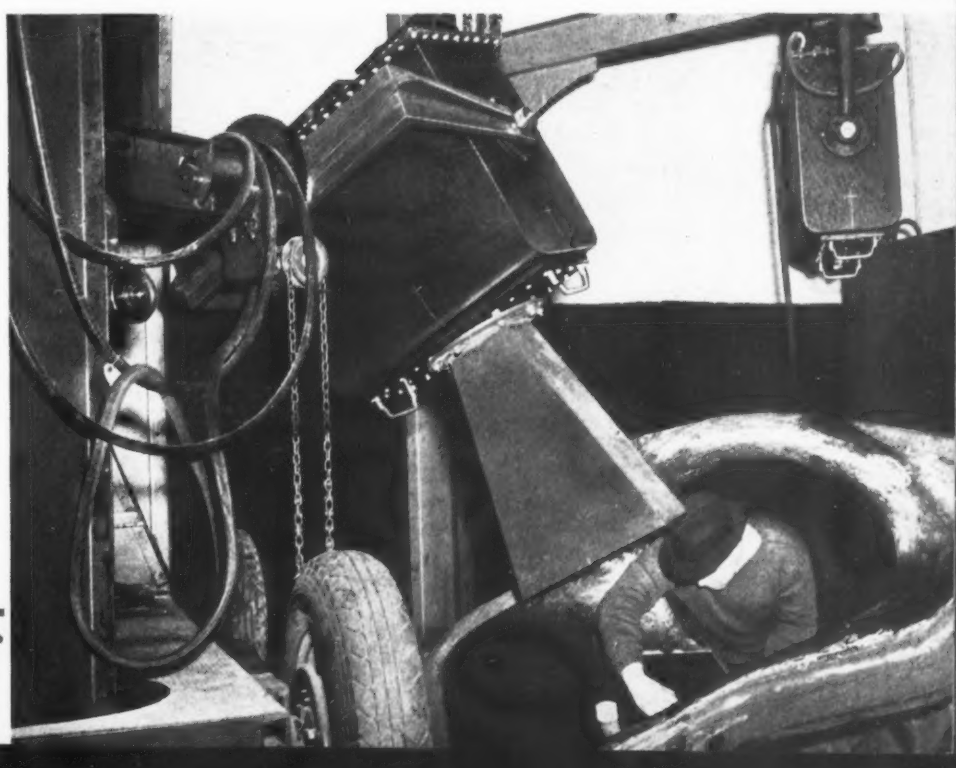

Fig. 15. Castings Subjected to Severe Stresses are Carefully Examined by X-ray Equipment for Hidden Flaws

Unionmelt Welding Expedites

Principles of This Method of Electric Welding, and Examples Showing Its Application in the Construction of Oil Tankers and Cargo Vessels in Shipyards from Coast to Coast

AMERICAN shipbuilders are exerting the utmost energy to construct cargo vessels and oil tankers in sufficient numbers to counteract the heavy toll of marauding submarines, surface raiders, and aircraft. According to Admiral Emory S. Land, chairman of the Maritime Commission, between 130 and 134 new vessels will be completed this year, in addition to the 105 ships in the long-range program of the Commission which were delivered up to the beginning of September.

Almost six hundred ships, totaling over six million deadweight tons, are to be completed during 1942, and in the first quarter of 1943 alone it is anticipated that more shipping will be delivered than was produced in the United States during the whole of 1918 in the effort to meet the losses of the first World War. In the present emergency, the shipbuilding program is about two years nearer its goal than it was in the last crisis of that war.

The tremendous activity today in shipbuilding would not have been possible, according to the president of the American Bureau of Shipping, except for the adoption of electric welding by shipbuilders. Whereas in the last war, steel ships were completely assembled by riveting, that method has been superseded today to a remarkable extent by electric welding. For several years the Sun Shipbuilding & Dry Dock Co. has been building oil tankers of completely welded construction, and this summer witnessed the launching of the first all-welded cargo ship, built to the specifications of the Maritime Commission, from the ways of the Ingalls Shipbuilding Corporation at Pascagoula, Miss. In practically all building of merchant ships today, welding is being employed at least 85 per cent in the fabrication of steel plates and structural shapes.

The Unionmelt electric welding process, developed by The Linde Air Products Company, has been found particularly advantageous in shipbuilding because it enables high-quality welds to be made at comparatively fast speeds by operators who have had relatively little training in welding. As the process is completely automatic, the quality of the weld is not dependent upon the human element. In this process, heat is generated by the passage of electric current from an electrode to the plates being joined. The heated end of the electrode is kept completely covered by a highly resistant granulated material or welding composition known by the trade name "Unionmelt."

The entire welding action takes place beneath this granulated material without any visible arc and without sparks, spatter, smoke, or flash. Hence the welders need no protective helmet or goggles. Within the layer of Unionmelt, an intense, concentrated heat is generated, so that the bare-metal electrode and the edges of the steel plates to be welded are melted and fused. Molten metal from the electrode is thoroughly mixed with the melted base metal to form the weld. While the weld is being made, a subsurface layer of the granulated material melts and floats as a liquid blanket over the molten weld metal.

The granulated material, when molten, makes possible the use of unusually high current densities, which permits rapid generation of intense heat for melting the steel plates. The molten granulated material is a good heat insulator, and thus concentrates the heat in a relatively small zone. It acts also as a cleanser for the weld metal, washing the metal which melts from the electrode and absorbing impurities from the fused base metal.

This welding process is fully automatic, being applied either by large, permanently installed machines, or by comparatively small, portable equipment that is usually guided along the work on a suitable track, as seen in Fig. 2. The bare welding rod is continuously drawn from a reel and fed by the welding head into the welding zone. The granulated material is automatically delivered through the welding head, and progressively laid down along the seam being welded, so as to cover completely the rod end.

Building of Merchant Ships

By F. G. OUTCALT
Engineer
The Linde Air Products
Company
New York City

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Fig. 1. Two Automatic Unionmelt Welding Heads on a Large Welding Machine in the Shipyard of the Sun Shipbuilding and Dry Dock Company

At the beginning of an operation, a special "fuse," such as a wad of steel wool, is used to start the weld, since the granulated material is not a conductor of electricity when it is cold. After the steel wool has been covered with the granulated material and the welding current has been turned on, enough heat is immediately produced to melt the steel wool and the adjacent layer of granulated material, thereby enabling the welding operation to begin. The granulated material is progressively fused by the heat that is generated as the welding operation progresses.

Since only part of the granulated material is fused during welding, the unfused material is picked up either manually or by the use of a suction hose, as seen in Fig. 3, which returns it to a hopper to be used over again. The portion

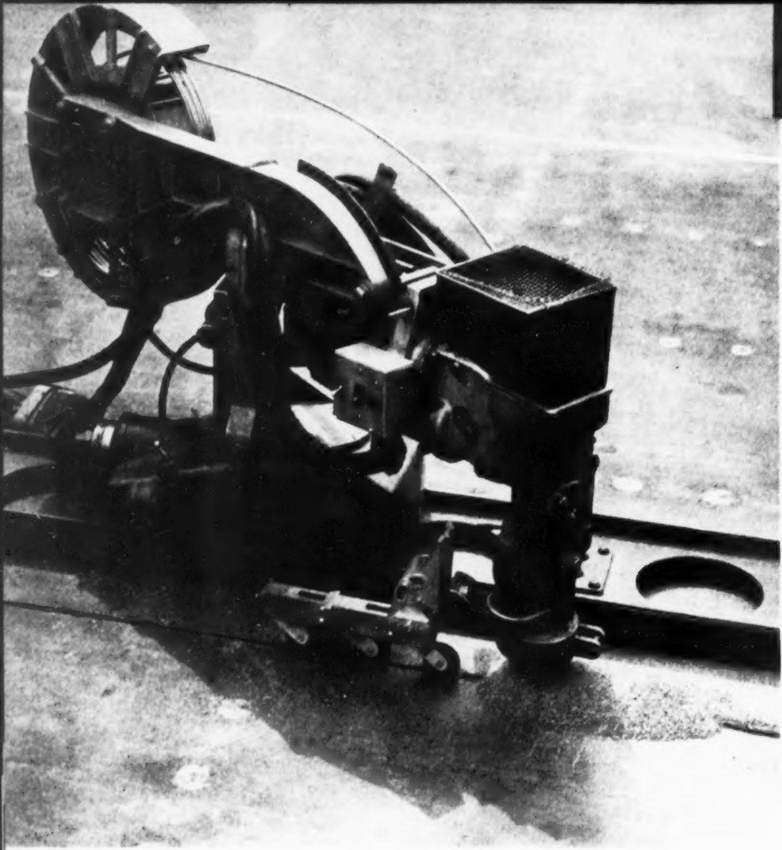

Fig. 2. In Unionmelt Welding, the Electrode is Completely Covered by a Granulated Material, and the Operation is Performed without any Visible Arc, Sparks, or Smoke

of the granulated material that has become fused solidifies behind the welding zone, as seen in Fig. 4, and upon cooling, contracts and detaches itself from the welded plates, exposing the clean, smooth weld.

Welding voltage, electric current, speed of operation, and rod feed are all automatically regulated by means of electrical controls, and depend upon the kind of material being welded, its thickness, the type of prepared edges on the plates to be welded, the desired depth of fusion, and the shape and reinforcement of the weld. Once the weld is started, the operator merely pushes the buttons or adjusts controls.

Butt, fillet, and plug welds can be made. In making butt welds with one pass, when complete penetration is desired, some support must be provided under the seam to prevent the fluid metal from running out of the bottom of the joint. A copper bar, a sliding copper shoe, and a trough filled with Unionmelt material have all been successfully used for backing up butt welds. When the granulated material is used as a backing, a reasonably smooth bead can be obtained on the bottom of the weld, similar to that on the top surface.

For much ship work, however, no backing is used for butt joints, the weld being made in two separate operations. A partly penetrated weld supported by the unfused portion of the joint is first made from one side and the finishing weld, supported by the first weld, is made from the other side. When the pieces to be welded can be turned over, so that both portions of the weld can be made in the "down-hand" position, Unionmelt welding is used for both portions of the weld. When turning is impractical, an "overhead" manual arc-welded deposit can be used as backing for the main Unionmelt weld.

In the construction of ships, Unionmelt welding is employed both for the prefabrication of structural sections in the shop or assembly yard, and for the assembly of the various sections on

Fig. 3. Typical Unionmelt Welding Operation being Performed on Ship Plates with Portable Equipment in One of the Busy Shipyards on the Pacific Coast

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Fig. 4. Close-up View of an Automatic Welding Operation, Showing a Section of the Clean, Smooth Weld and Glasslike Fused Unionmelt that has Not Yet Cracked off

the shipways. The procedure varies with conditions, but in general, it is the practice to fabricate tank-top, bulkhead, and deck units in as large sections as can be handled by the available crane facilities. These fabricated units are then carried to the shipway and welded to the bottom shell, tank tops, margin plates, side shells, or adjoining deck plates, as the case may be.

In addition to these main units, there are minor units, such as the shaft-alley, machinery-deck, and casing assemblies which are also Unionmelt welded. In addition, the process has been used for fabricating the structural members of boiler foundations, which are tack-welded and then placed in a positioning jig for final welding. Arc-welding is applied in assembling prefabricated units to the ships wherever welds must be made in vertical planes, overhead, or where cramped quarters do not permit the use of Unionmelt welding machines.

The thicknesses of plate that are Unionmelt-welded in prefabricated units vary from 1/4 inch on plates for casings to 9/16 inch for plates used as tank tops, and the fillets vary from 1/4 to 1/2 inch. Experience has shown that, by the use of portable equipment, speeds of from 18 to 28 inches per minute are obtainable when welding plates of these thicknesses.

In the construction of welded cargo ships the entire flat bottom of the ship often is laid on the ways and the plates are welded together. The first welding job on a ship is usually that of joining the butt seams of the flat keel and the strakes of the bottom shell. Prefabricated unit assemblies of floors and tank tops are next transferred to the shipways and welded to the bottom shell plate.

Much of the steel plate used in ship construction is prepared on the edges for welding by the use of oxy-acetylene flame-cutting. The plate edges may be either square-cut, single-beveled, or double-beveled either with or without an un-

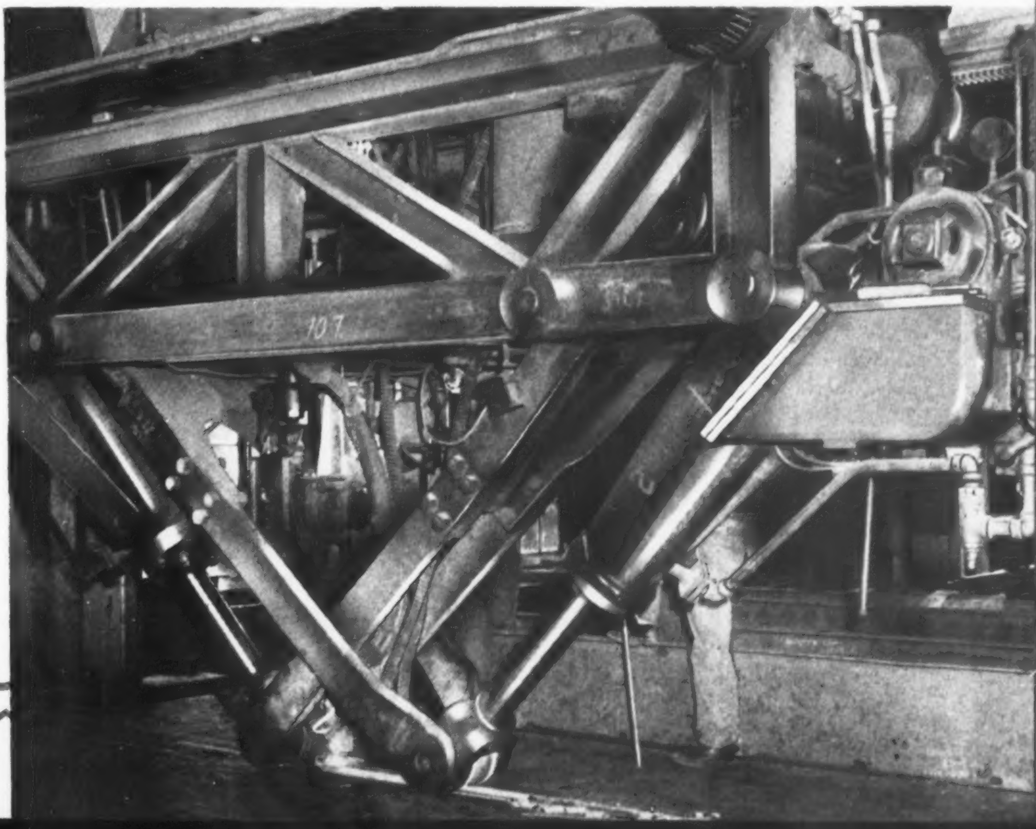

Fig. 5. Large Welding Head on a Machine Provided with Retractable Rollers that Force Ship Plates into Alignment and Clamp Them on Unionmelt Material

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beveled root face, depending on the thickness of metal and the type of joint to be used.

In Fig. 3 is shown a typical Unionmelt welding operation in progress at the Moore Dry Dock Co., Oakland, Calif. Here the portable equipment is guided along the seam by an operator and the excess granulated material is picked up by a special "vacuum cleaner" hose. This equipment consists of a standard welding head mounted on a motor-driven carriage which may be set to travel at any required welding speed to suit the work.

Equipment of this type is frequently set up to operate on a track like that commonly employed in oxy-acetylene cutting operations on large steel plates. Such a track is seen in Fig. 2, which shows equipment employed in welding the inner bottom of a cargo barge at a yard of the Dravo Corporation. The motor generators and control boxes used for operating the equipment are mounted for easy transportation from place to place by means of a crane.

The largest Unionmelt welding machines and the greatest number of portable units installed in any shipyard are at the Sun Shipbuilding & Dry Dock Co., Chester, Pa. These machines do a large percentage of the welding for the vessels built by this concern. A general view of one of the large machines in Fig. 6 shows that this machine has three working stations. In the first station structural stiffeners are clamped in close contact with steel plates by the application of pressure from a large number of overhead pneumatic jacks. While thus clamped, the stiffeners are tack-welded to the plate by means of manual arc-welding equipment.

The steel plate with the required number of stiffeners tack-welded to it is then moved to the center station of the machine, where it is placed on a table that can be tilted to an angle of 45 degrees, as seen in Fig. 7, so that the weld can be made in a horizontal position. Two welding heads travel automatically across the top of the machine frame to lay beads completely along one side of each stiffener. The table is then tilted in the opposite direction, so that the other side of the stiffeners can be welded to the bulkhead with the same welding heads.

The successive plates are finally moved to the station at the right-hand end of the machine, which may be seen in Fig. 6, where as many plates as may be required to obtain a complete bulkhead or shell section are butt-welded together. Two rows of pneumatic jacks are used at this point to hold the plates securely in line. The welding head is suspended from the top of

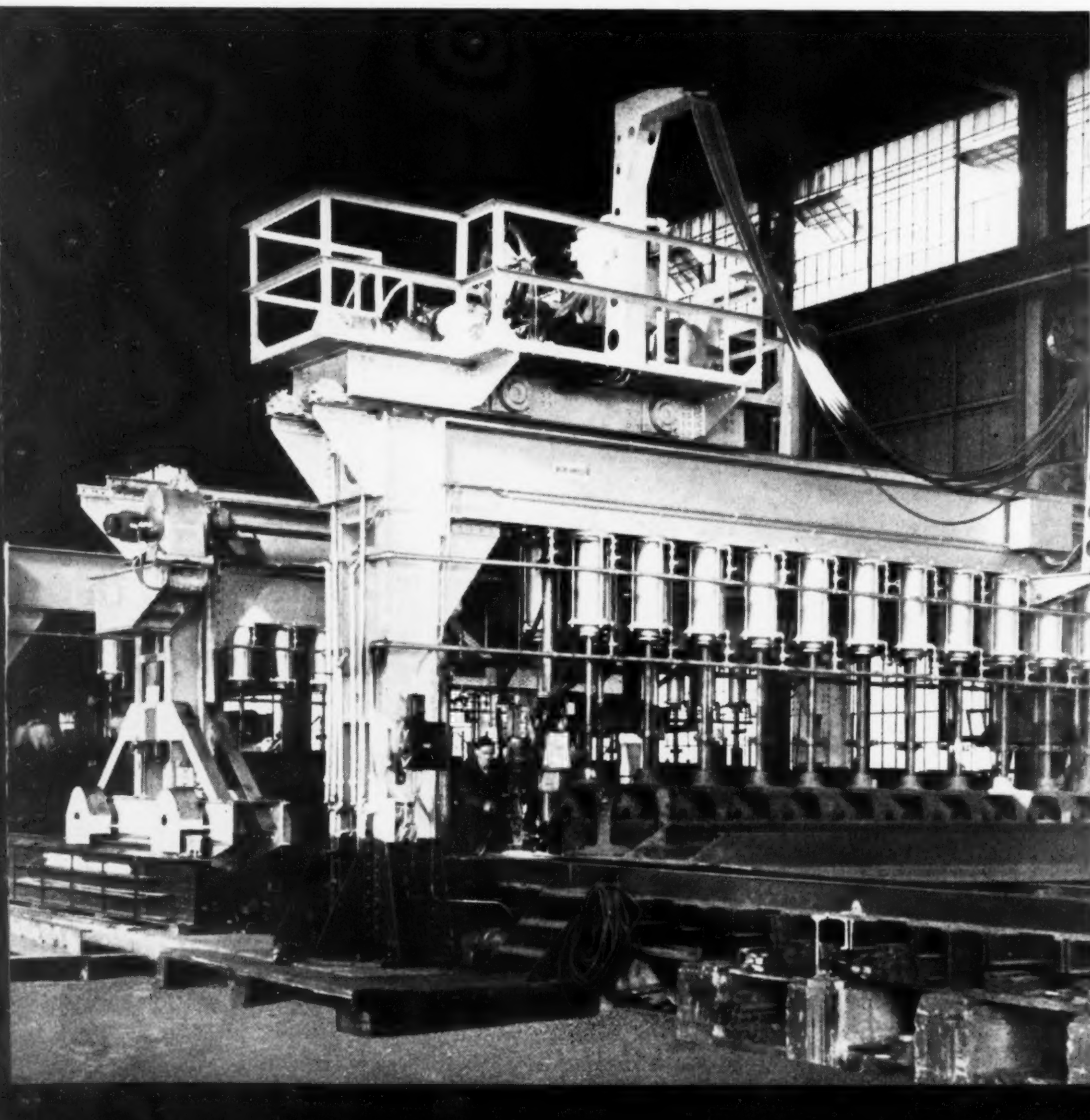

Fig. 6. Huge Three-station Machine in the Sun Shipyard, which Automatically Welds Structural Steel Stiffeners to Both Sides of Ship Plates

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the machine frame in this station and passes completely across the machine. At the time that the photograph was taken, the welding head was in position for starting a butt weld.

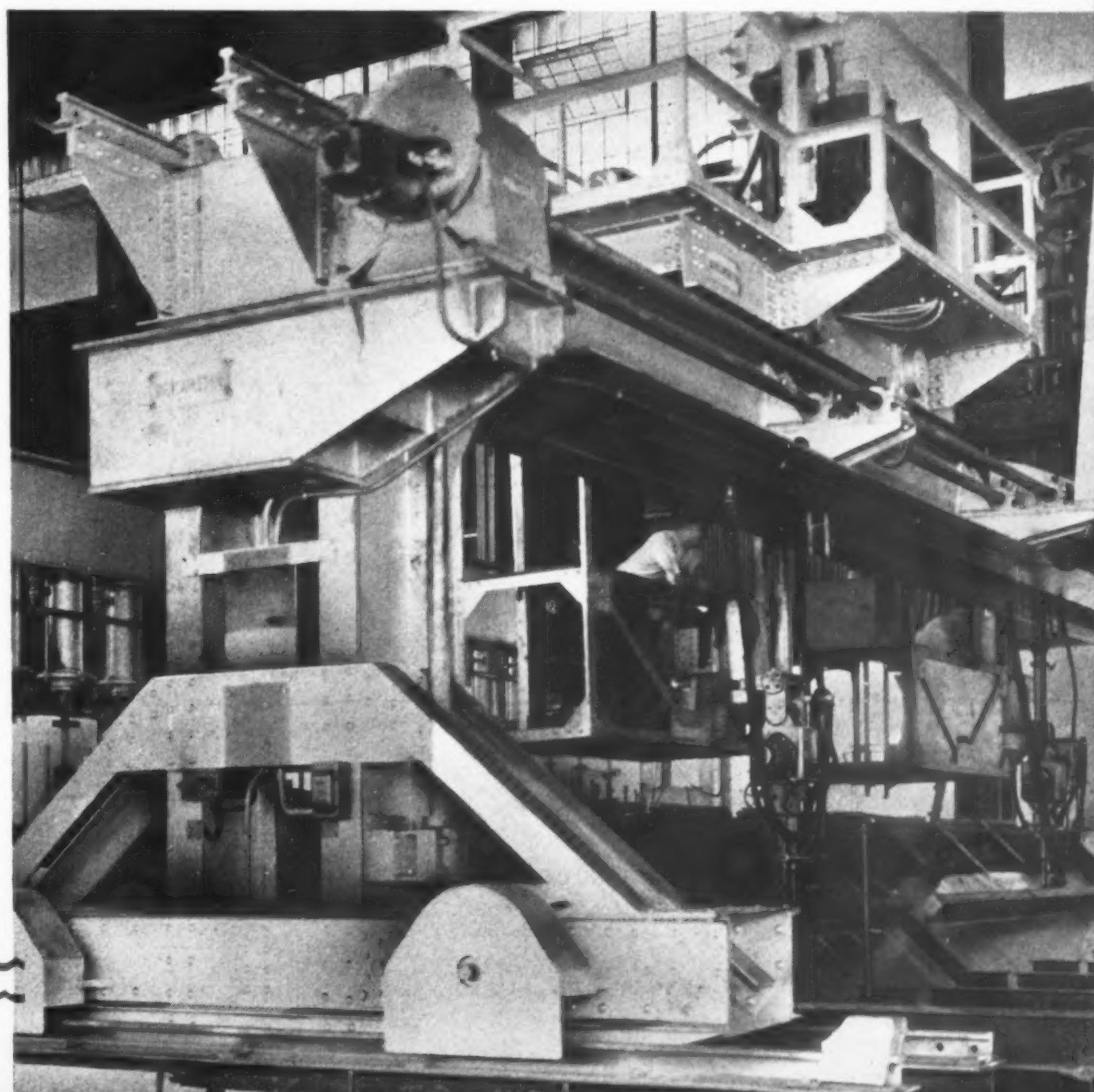
This large machine was the first to be used for Unionmelt welding in ship construction. However, somewhat similar large units have later been installed in this yard. In Fig. 1, for example, are seen two automatic Unionmelt welding heads on another large machine being used for attaching a flanged-plate stiffener to a shell plate or weldment 35 feet long. A double fillet weld is being made. The stiffener was produced from steel 7/16 inch thick. It is 12 inches deep and has a 5-inch flange, while the shell plate is 3/4 inch thick and about 6 feet wide. The welding heads are equipped with special extensions for fillet welding.

For this operation, the shell plate is mounted on a tilting table and positioned at an angle of 45 degrees, so that the fillet weld can be made in the vertical or down-hand position. The two welding heads are operated simultaneously, each making half of the weld and thus speeding up the operation. The rear head creates a weld that fully penetrates the weld made by the front machine. When one fillet is completed, the entire shell plate is swung over and another fillet made on the opposite side of the stiffener. In producing this fillet, the first weld is completely penetrated. The welding speed is about 30 inches a minute, electric current of 650 amperes and 27 volts being used. No beveling of plates is required.

The welding head of another huge machine designed for large-scale one-piece butt-welding of ship plates with a minimum of tack-welding and "jigging" is seen in Fig. 5. This machine can be applied to plates ranging in thickness from 1/4 inch to 1 1/4 inches. The plates are placed in position on the welding bed by means of a crane, after which retractable rollers are lowered and positioned on the work so that, as the welding operation proceeds, the plate edges are progressively forced into alignment with each other and clamped snugly on a trough of Unionmelt material beneath.

Fig. 4 shows a close-up view of one of the retractable rollers. In this illustration, the whitish covering on the uncovered portion of the completed weld is glasslike fused Unionmelt that has not yet cooled sufficiently to contract and crack from the weld. The machines here shown in use at the Sun Shipbuilding & Drydock Co. on which Unionmelt welding heads are used are covered by patents issued to that concern.

Fig. 7. Middle Station of the Welding Machine Seen in Fig. 6 Showing the Two Welding Heads which Feed Automatically across Members being Welded



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Builder of America's Cup

Shipbuilding Methods in a Yard that Once Built Vessels Used in the War of 1898, and Later has Specialized on Fine Yachts

By A. M. MAIN, Vice-President
Bath Iron Works Corporation
Bath, Maine

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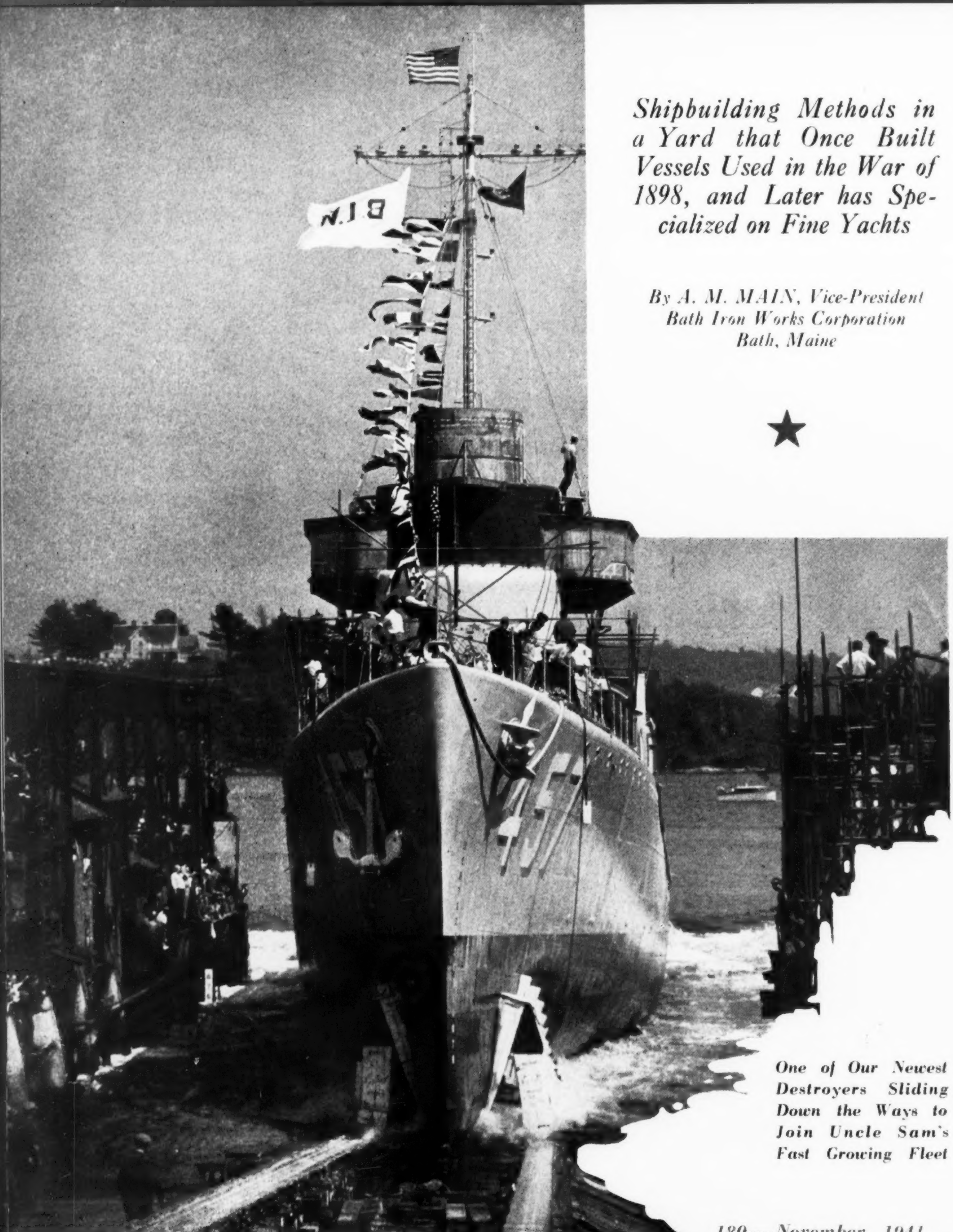

One of Our Newest Destroyers Sliding Down the Ways to Join Uncle Sam's Fast Growing Fleet

Defender Turns to Destroyers

THE shipyard of the Bath Iron Works Corporation, Bath, Me., started building its first vessel in 1889, and during the remaining period of the nineteenth century built a considerable number of monitors, gun boats, cruisers, and torpedo boats of the types used by the United States Navy at that time. During the first World War, the Yard concentrated on the construction of destroyers, and turned out eleven of them while the war was in progress.

When the war was over, shipbuilding slackened, and in 1925 stopped completely at the Bath Iron Works. The Yard remained idle until 1927, when it was taken over by a group headed by William S. Newell, who had started in this Yard as a helper in a riveting gang after graduating from M.I.T. as a naval architect and marine engineer, and had risen to works manager during its prosperous days. The new management turned to the building of fine yachts for millionaires of the boom period in the late 1920's, and earned an enviable reputation constructing such well-known craft as J. Pierpont Morgan's *Corsair* and H. S. Vanderbilt's *Ranger*, which decisively defeated the British challenger of the *America's* cup back in 1937.

In 1932, the Bath Shipyard again received a destroyer contract, and since then has completed

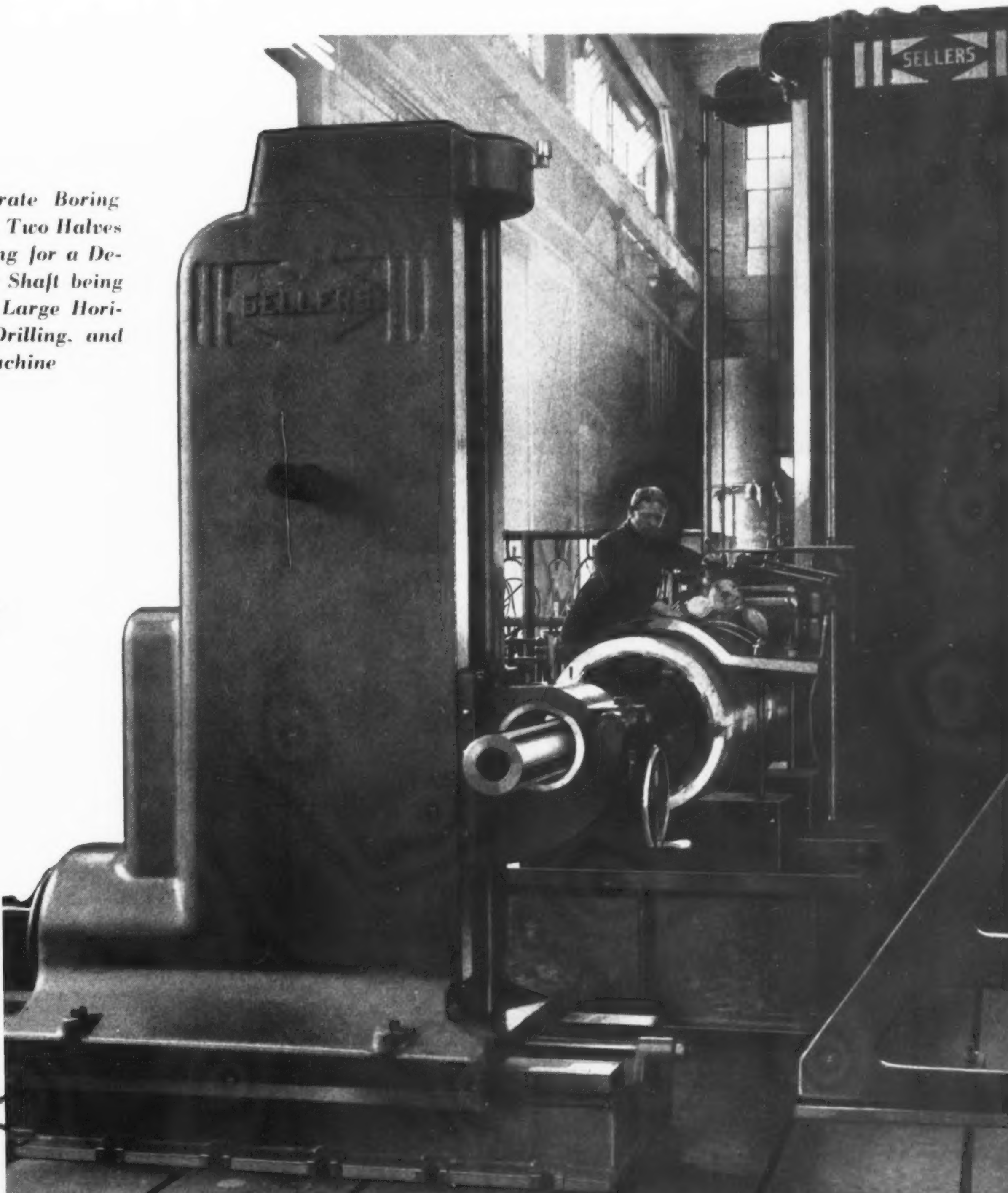

Fig. 1. An Accurate Boring Operation on the Two Halves of a Stern Bearing for a Destroyer Propeller Shaft being Performed on a Large Horizontal Boring, Drilling, and Milling Machine

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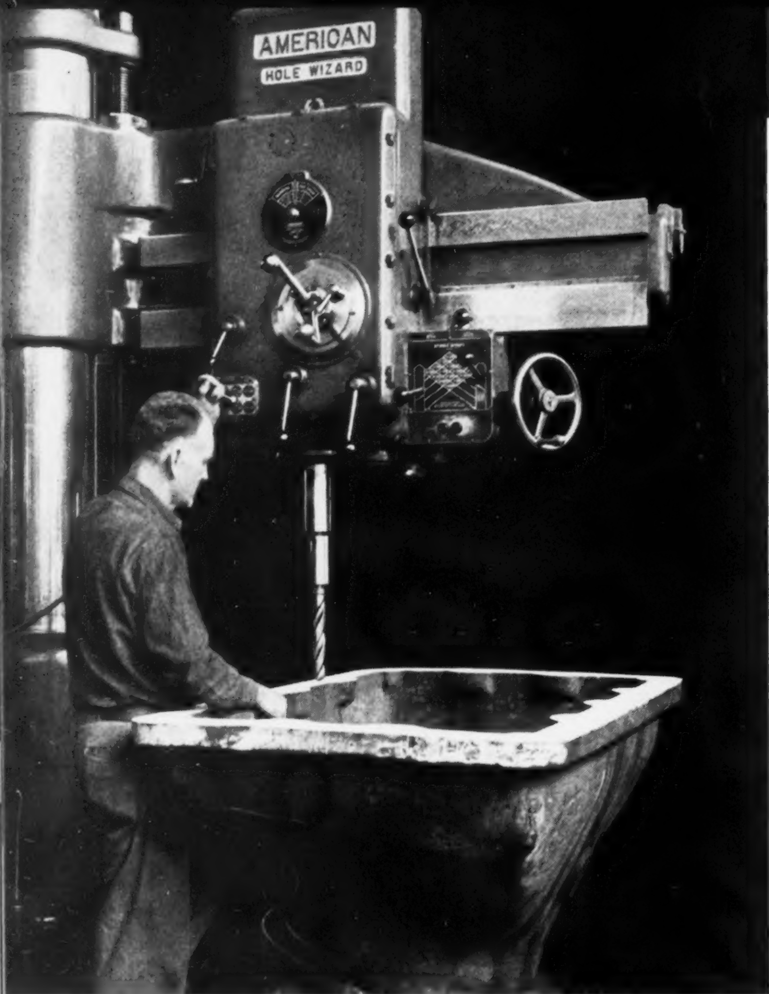


Fig. 2. Drilling a Series of 1 1/8-inch Holes around One End of a Large Sea-chest Casting on a Radial Drill

many vessels of this type for our modern Navy. With such a record of past performance, it is not surprising to find that this shipbuilding concern now holds contracts for the building of a considerable number of destroyers. To meet the production problems involved in rushing these destroyers to early completion, new ways are being constructed, an entirely new steel fabricating shop known as the Harding Plant has been completed, and the shops at the shipyard itself have been supplied with much new equipment. Operations on some of the latest types of machine tools and other metal-working equipment are described in this article.

A large Sellers horizontal boring, drilling, and milling machine is shown in Fig. 1 engaged in finish-boring the two halves of a stern bearing for a destroyer propeller shaft. The two bronze castings are approximately 6 feet long and about 2 feet in internal diameter. The boring cuts are taken on a series of twenty lands, about 1 1/4 inches wide, which extend the full length of the castings. The cutter-head is provided with three tool bits, as may be seen in Fig. 6. When the operation is completed, the bore must be to size and straight within plus nothing,

Fig. 3. (Below) Finish-turning a Destroyer Propeller Shaft which Must be in Accurate Dynamic Balance when Operation is Finished, and within Close Dimensional Tolerances

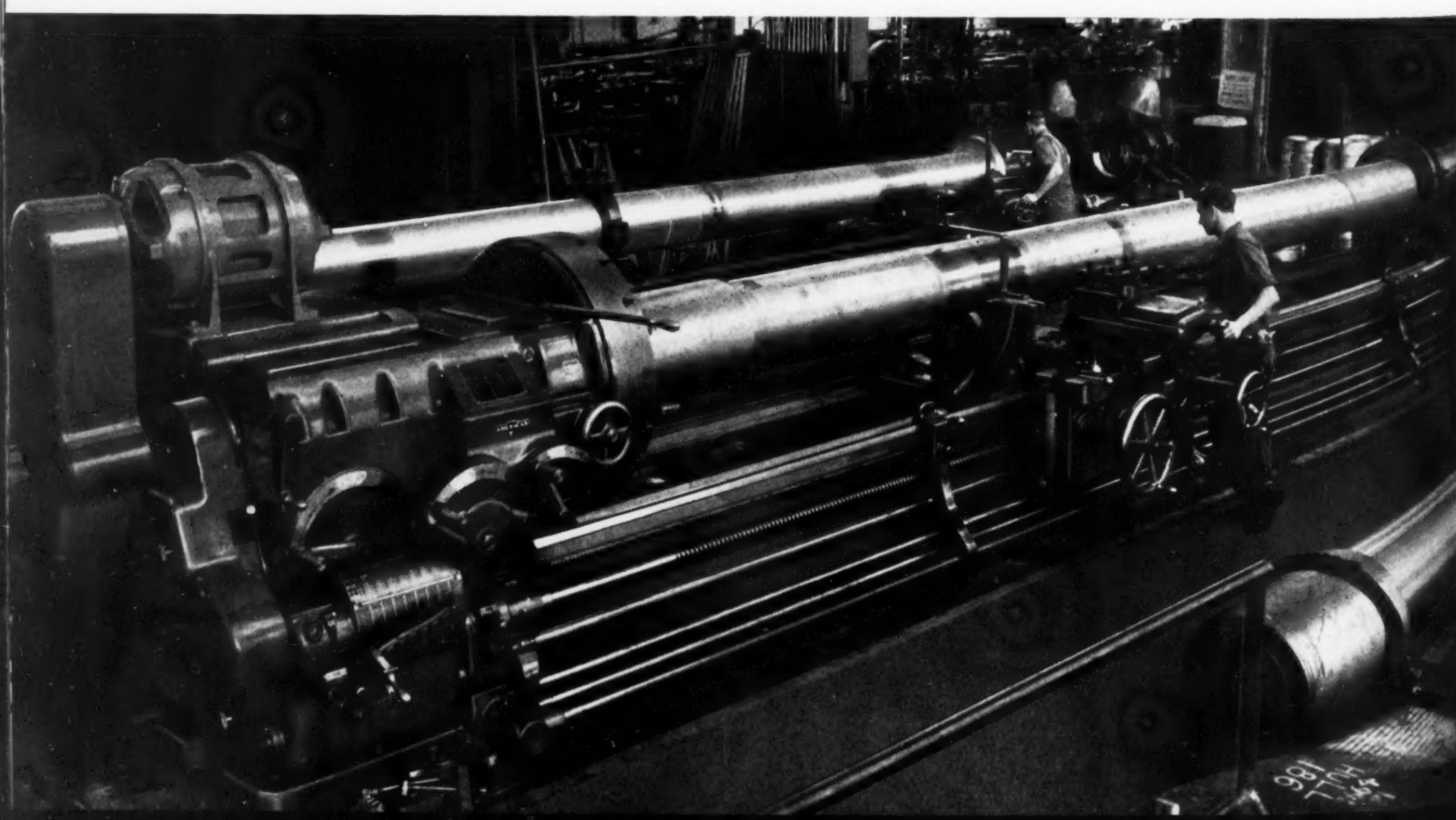
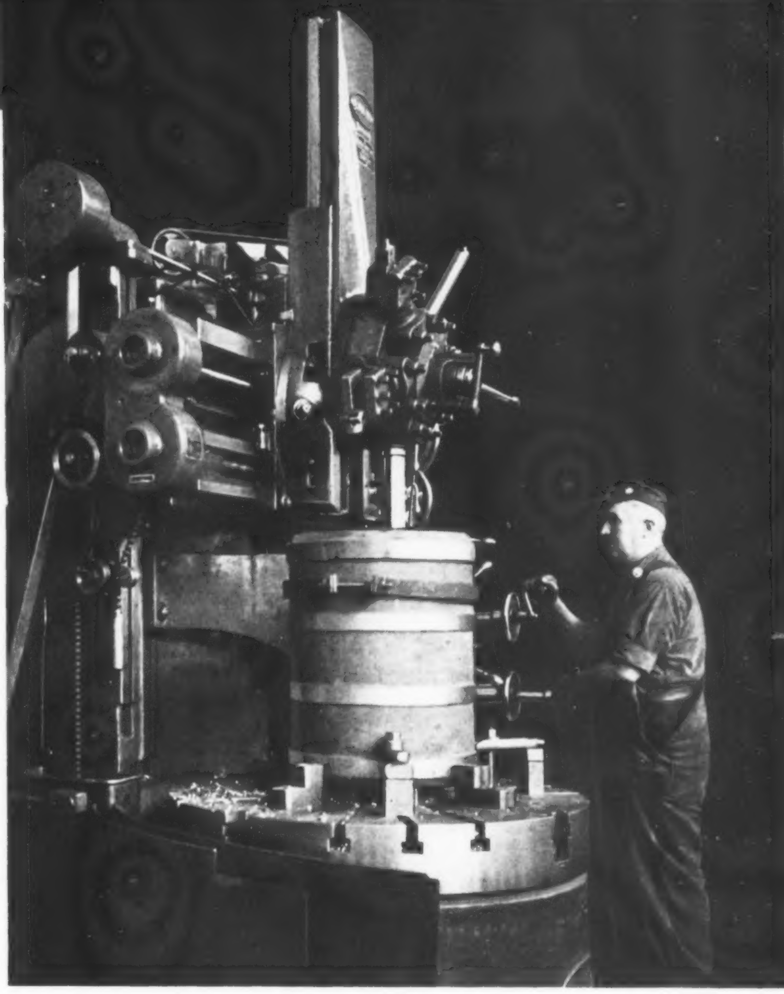


Fig. 4. Boring and Grooving Operations being Performed on a Large Iron Casting by a Vertical Turret Lathe

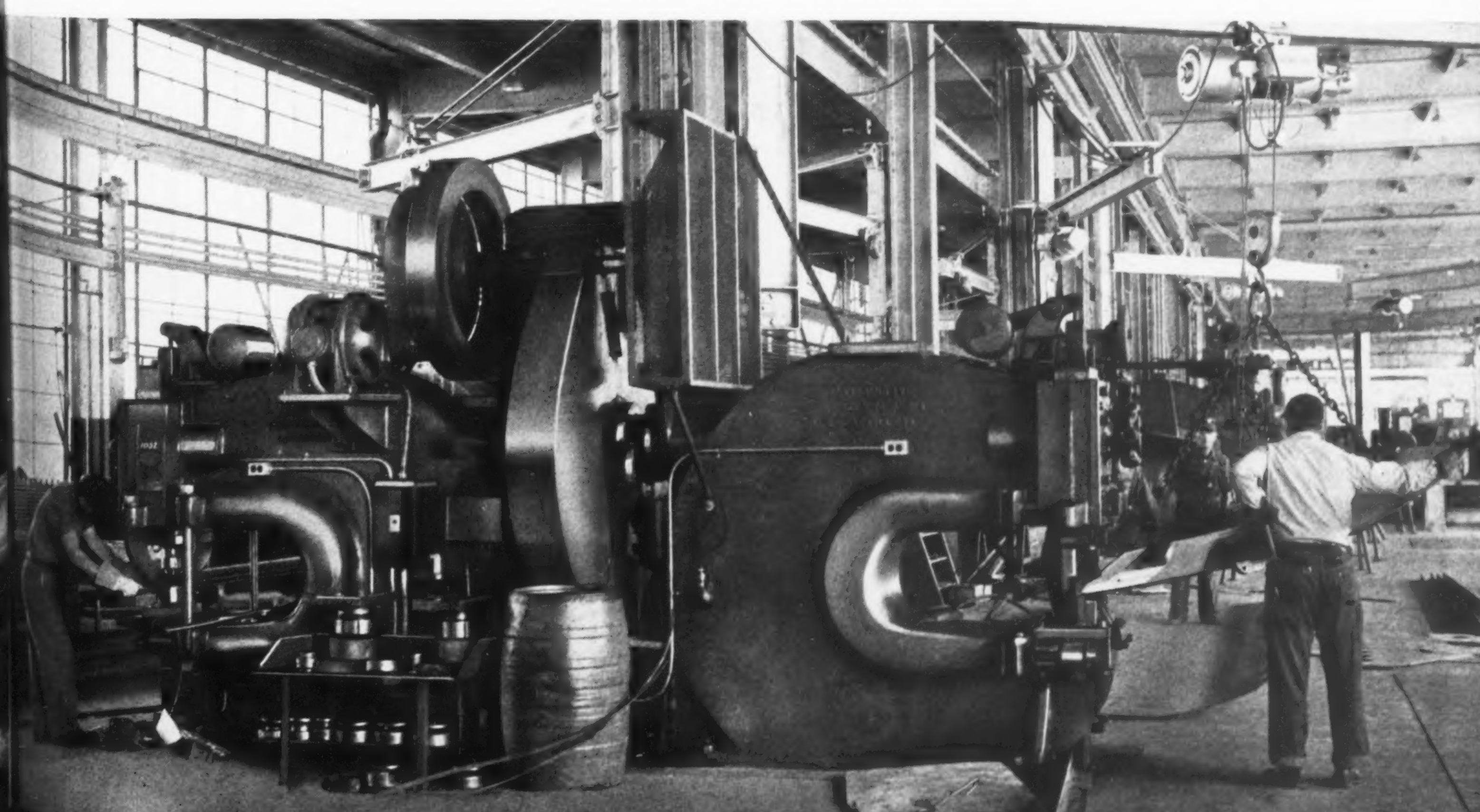


minus 0.003 inch. In a later operation, the grooves or depressions between the lands are accurately planed to receive bronze bars with rubber inserts, which provide the bearing surface. The boring mill is equipped with a 6-inch main spindle and a 2-inch high-speed auxiliary spindle. There is an attachment for cutting threads from one to twenty per inch.

Propeller shafts are finish-turned by the big American engine lathe seen in the foreground in Fig. 3, which has a swing of 42 inches and a length between centers of 65 feet. The machine is equipped with two carriages so that cuts can be taken at opposite ends of the propeller shafts at the same time. The long propeller shafts are received from the forge plant rough-turned, and after they have been centered, a light cut is taken in the big lathe. Then the shafts are checked for dynamic balance, being returned to the lathe usually three or four times until concentricity and true balance have been attained.

After a shaft has been balanced, it is again returned to the big lathe for finish-turning. In this operation, some diameters are held as close as plus 0.005 inch, minus nothing. Carboloy cutters supplied by the O.K. Tool Co. are used

Fig. 5. (Below) Double-end Machine, One End of which is Used for Shearing Plates, and the Other for Punching Holes up to 6 Inches in Diameter through Steel Plates



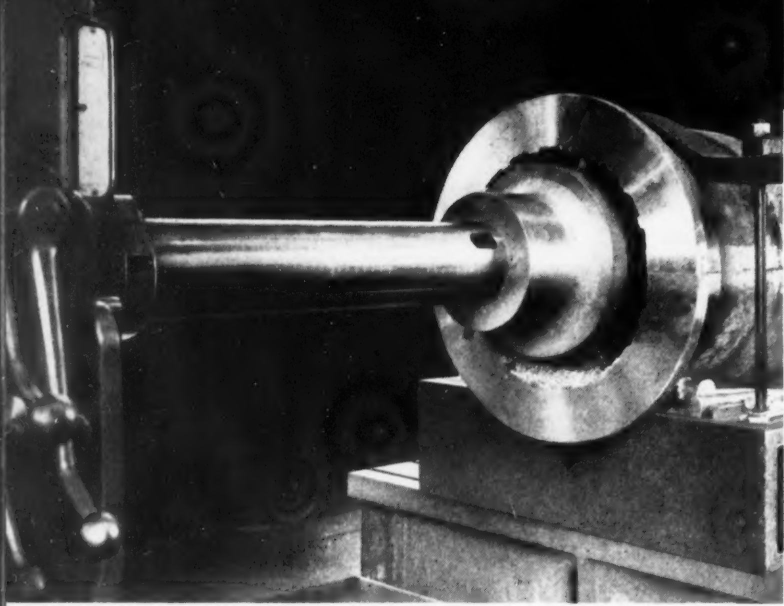


Fig. 6. Boring-bar and Tool-head Used in the Operation on the Stern Bearing Halves Illustrated in Fig. 1

for taking fast, heavy cuts, and cutters of Rex AA tool steel for the final finishing cuts. In the background of Fig. 3 is seen a second large lathe engaged in turning another shaft.

A typical job assigned to an American radial drilling machine is illustrated in Fig. 2. It consists of drilling holes in a sea chest for a cargo vessel after the large steel casting had been fitted to the side of the ship. Holes 1 1/8 inches in diameter are drilled to a depth of about 1 3/4 inches in the flange that extends around one end of the casting.

The job shown in Fig. 4 consists of machining the inside of a spring bearing shell on a Bullard vertical turret lathe. Various surfaces are bored to one diameter in this operation, and then a series of internal dovetail grooves are cut into the bored surfaces to receive babbitt. All these cuts are taken with tools mounted on the turret. The iron casting measures approximately 19 inches in the bore, and is 30 inches long. The finished surfaces on the outside of the casting were turned by tools on the side-head.

Large coupling bolts 21 1/4 inches long with a thread 2 inches in diameter at one end and a maximum head diameter of 3 1/2 inches at the other end are produced at fast manufacturing rates by the Warner & Swasey turret lathe illustrated in Fig. 7. Two of these bolts are seen lying on the cross-slide, one of them having a nut screwed on the threaded end.

In this operation, a cutter on the square turret of the cross-slide is first employed to break down the end of the stock, after which the stock is fed forward to a stop on the hexagon turret. The single-cutter turner in the next station of the hexagon turret, which is seen in action in the illustration, is next employed to turn the bolt almost its entire length to a diameter of 2 1/2 inches. The stock is adequately supported during this cut by rollers on the turner.

At the end of the foregoing cut, a centering tool on the next station of the hexagon turret, seen extending toward the front of the machine, drills a hole in the overhanging end of the stock. Then a center mounted on the next station of the hexagon turret is advanced to support the overhanging end of the stock during all the remaining cuts, which are performed by tools on the square turret of the cross-slide. These cuts consist, in sequence, of turning to three different diameters under the control of stops; nicking

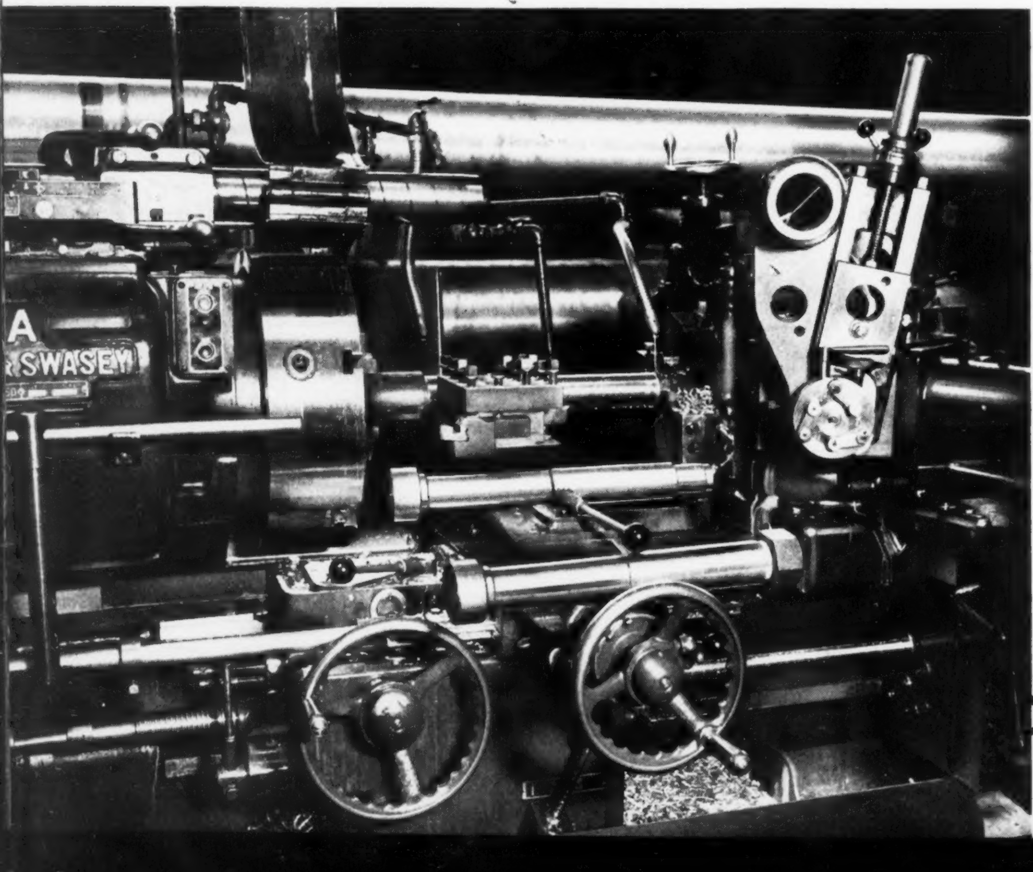


Fig. 7. Turret Lathe Tooled up for Producing Bolts 21 1/4 Inches in Length, Having a 3 1/2-inch Head Diameter

Fig. 8. Punching Holes 2 Inches in Diameter through a Deckhouse Stiffener on Machine Shown in Fig. 5

the bar where it is to be cut off; turning the head end; chasing threads on the opposite end; and cutting off the finished bolt.

The remaining operations to be shown in this article were photographed in the new Harding Plant which is devoted to steel plate fabrication.

The large machine shown in Fig. 5 is of double-end construction, the end seen at the right being equipped for shearing steel plates up to 3/4 inch thick, and the end at the left for punching holes up to 6 inches in diameter through 3/16-inch plate. Some of the punches and dies used in this end of the machine are seen lying on shelves adjacent to the machine.

Fig. 8 shows a close-up view of a typical punching operation performed on the machine illustrated in Fig. 5. In this operation 2-inch holes are being produced in a web of an I-beam that has been cut in half to produce two T-shaped members. Long arms attached to the ram housing can be adjusted to reach almost to the top surface of the shape being punched to serve as a stripper on the return stroke of the ram. This machine was built by the Kling Brothers Engineering Works.

In Fig. 9 is shown a 200-ton Southwark hydraulic press making a right-angle bend in a plate. The tool attached to one of the rams consists of a piece of pipe welded to a plate; this tool is used in conjunction with a die-block that has a large V-groove in it. The press is provided with two overhead rams at the front of the machine, which can be applied singly or in combination; a third ram in the bed, which can be applied upward; and a fourth ram in the column, which can be brought forward horizontally. The full pressure of 200 tons can be obtained with the two overhead rams by fastening them together with a suitable plate. This press is used continuously for flanging keel plates and bending bulkhead stiffeners, deckhouses for merchant vessels, and so on.

The Steelweld bulldozer shown in Fig. 10 is employed for straightening a large variety of long sections; the particular operation shown consists of straightening stiffeners that became warped while being cut out with oxy-acetylene torches. The machine has a rating of 25 tons. In operation, one side of the work-piece is positioned against two anvils attached to an adjustable member at the left-hand end of the machine, after which a steel block on a slide at

Fig. 9. Two-hundred Ton Hydraulic Press Having Four Rams for Performing Bending Operations on Steel Plate

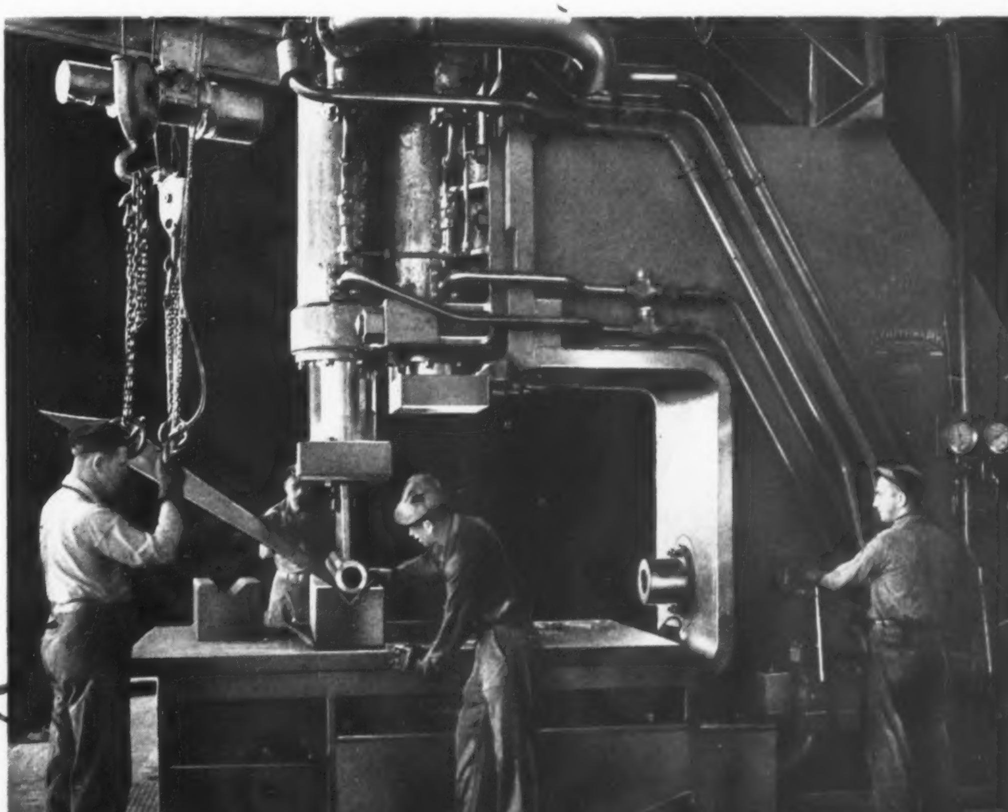


Fig. 10. (Left) Bulldozer being Used for Straightening a Longitudinal Stiffener that was Warped while being Cut by Oxy-acetylene Torches

Fig. 11. (Below) Punching Machine with Long Roller Table Employed on Ship Plates, except Those Used in Destroyer Hulls

the right is forced against the opposite side of the work through the action of crank-arms.

Any number of slide movements can be made quickly through the manipulation of the lever that the operator is seen grasping. Shifting this lever in one direction causes a forward movement of the bending ram, while shifting it in the opposite direction causes a return movement of the ram. In addition to straightening, this machine is employed for certain bending operations, such as cambering deck beams.

The Buffalo punching machine illustrated in Fig. 11 is used for punching holes through steel ship plates, with the exception of those used in destroyer hull construction, which are drilled instead of punched. The machine is equipped with a Lyssholme roller table by means of which the plates can be quickly positioned beneath the punching tool in accordance with punch-pricks previously laid out on the plate. Two sets of rollers on each side of the machine at the middle are actuated as the operator manipulates the lever held by his left hand to move the plates longitudinally. The remaining rollers to the right and left of the center are idlers and rotate freely as the plates are moved along.

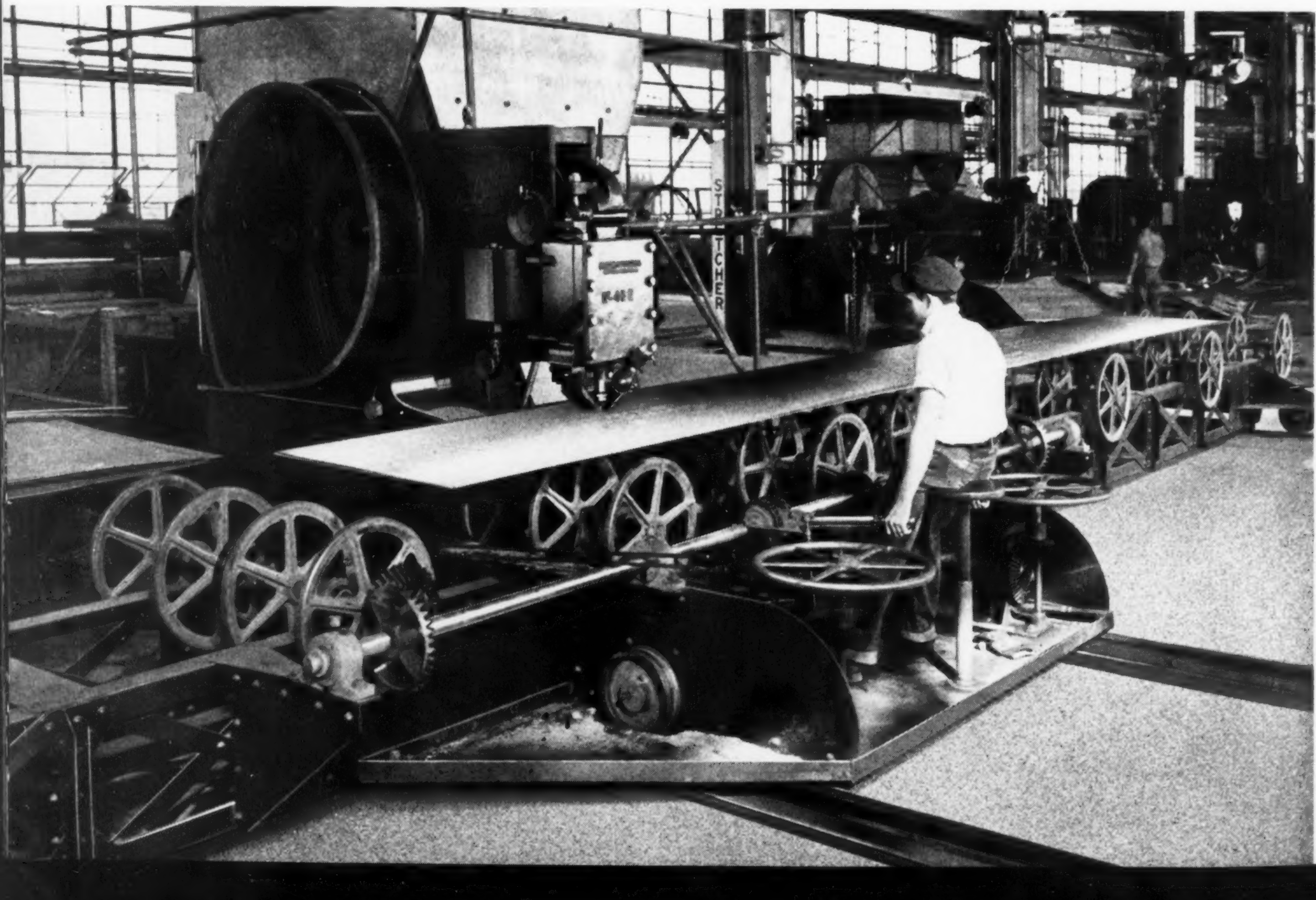
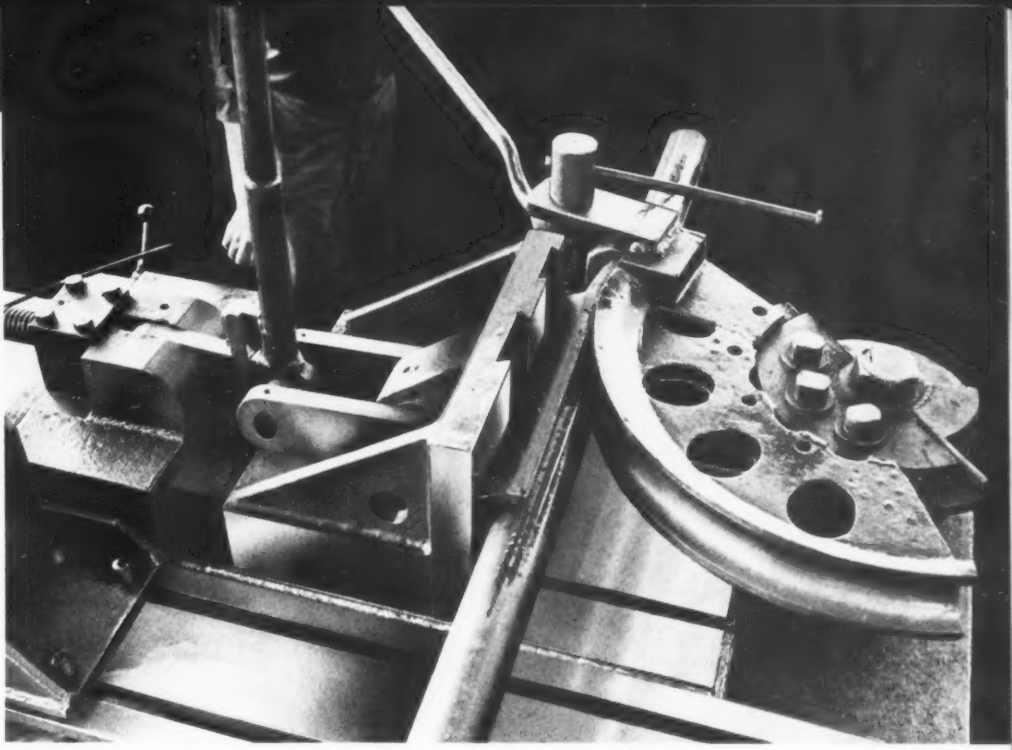


Fig. 12. (Right) Making a Double Bend in a Pipe by Employing a Hydraulic Machine, which is Used for Pipe up to 6 Inches in Diameter

Fig. 13. (Below) Wall-bracket Drilling Machines Drilling Rivet Holes in High-tensile Steel Plates for Destroyer Hulls



The entire table is moved in and out on four tracks as the operator manipulates a second lever with his right hand. Vertical adjustment of the driven rollers is accomplished through the large handwheels seen at the front of the table. This punching machine is employed on plates of mild steel up to 7/8 inch thick; the over-all length of the table is 50 feet.

The drilling of holes in the high-tensile steel plates used for destroyer hull construction is accomplished by means of the two Rollins wall-bracket radial drilling machines seen in Fig. 13, which are provided with arms 14 feet long. The plates are laid on a table built up from wood planks and the drills are fed right through the plates to the wood. The drills are power-fed, long levers operated by the left hands of the men being used to lift the drills quickly from each hole. These levers can also be applied to obtain a sensitive feed when desired.

Pipe up to 6 inches in diameter can be bent to desired radii in a large hydraulically operated Wallace pipe bending machine, a close-up view of which is shown in Fig. 12. The pipe is slipped into the machine over a mandrel that is fastened to a long rod connected to the opposite

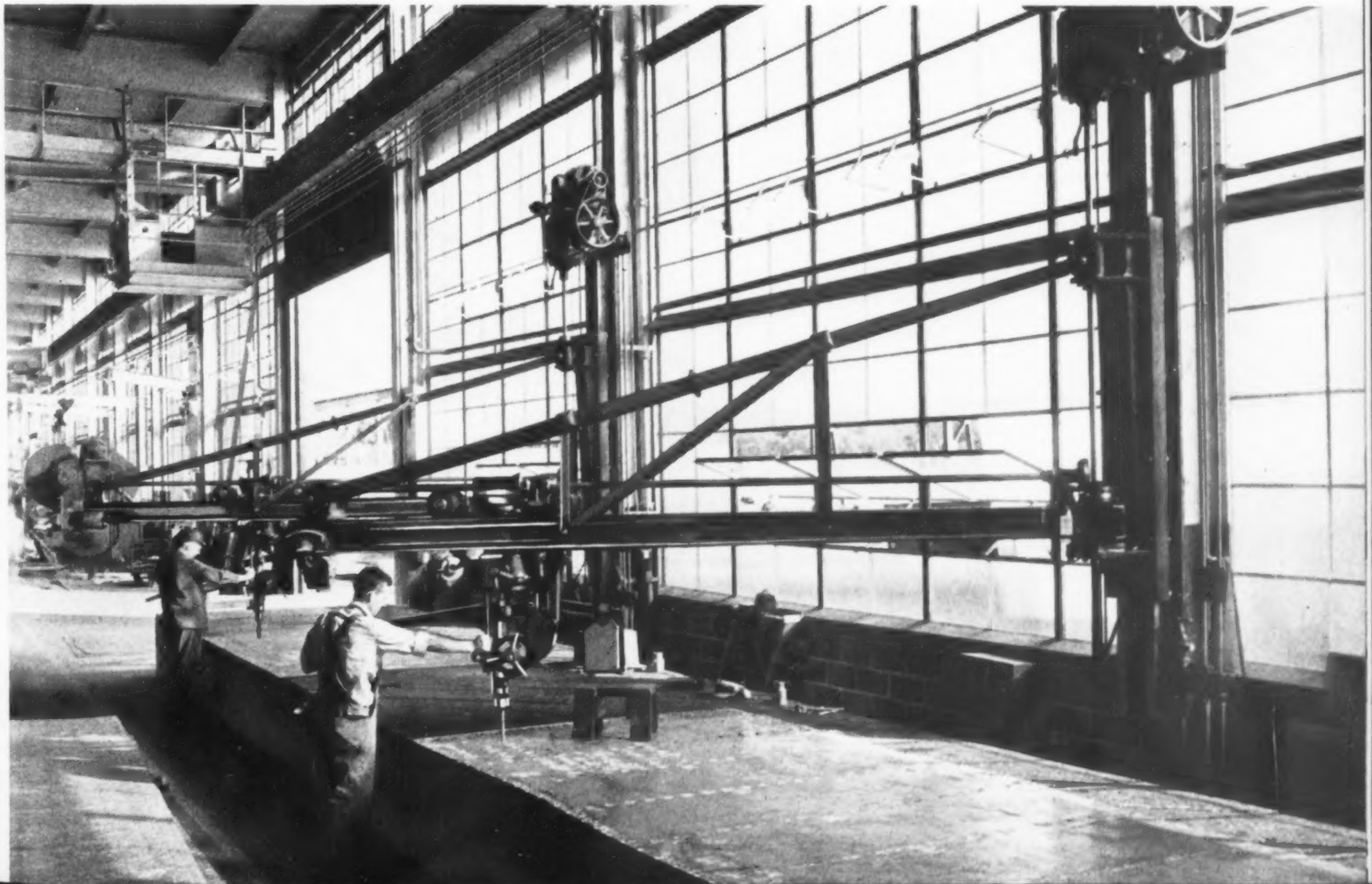


Fig. 14. Simple Forging Operation Performed by an Air Hammer that has a Capacity for Working Mild Steel up to 3 Inches Square

end of the machine. After the pipe has been clamped by the slide seen at the left against the bending form at the right, a hydraulic cylinder is actuated to advance the mandrel inside the pipe to a point opposite the center of the bending form. The mandrel prevents wrinkling or rupture of the pipe wall during the bending.

When the mandrel has been positioned, bending is accomplished through a second hydraulic cylinder, which swivels the bending form about its axis to force the pipe against the pressure block to which the handle is attached. Pipe and tubing in lengths up to 17 feet can be accommodated on this machine. Many bending operations can be performed cold with this equipment that previously had to be accomplished with the pipe hot.

The Quickwork-Whiting rotary shear shown in Fig. 15 is applied for cutting plate to any desired curves, regular or irregular, as required in ship construction. The curves can be cut to radii as small as 4 inches and as large as required. Plates up to 1/2 inch thick are sheared straight through by this machine, and plates up to 5/8 inch thick are sheared by joggling them so as to feed a little at a time. In the illustration, the machine is shown set up for shearing with cutters 10 inches in diameter. These circular cutters are knurled to assist in pulling the plates along. Either right-angle or bevel cuts can be made.

A large variety of light forging is done by means of the Nazel air hammer illustrated in Fig. 14, which has a capacity for working bars of mild steel up to 3 inches square. The hammer can strike as many as 210 blows per minute at a maximum stroke of 12 inches. Ordinarily, the operator controls the ram movements through a foot-pedal, but there is also a hand-lever. Blows of variable force are instantly obtainable.

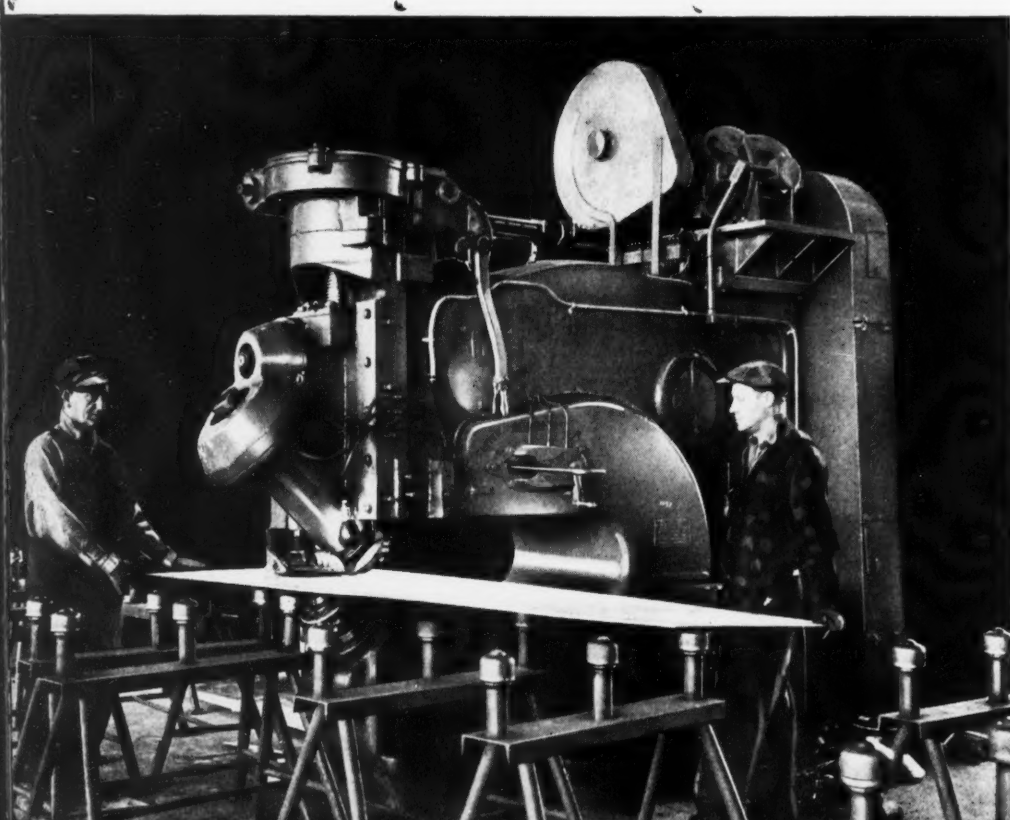


Fig. 15. Rotary Shears Employed for Cutting Steel Plates to Various Curves of Regular or Irregular Contour

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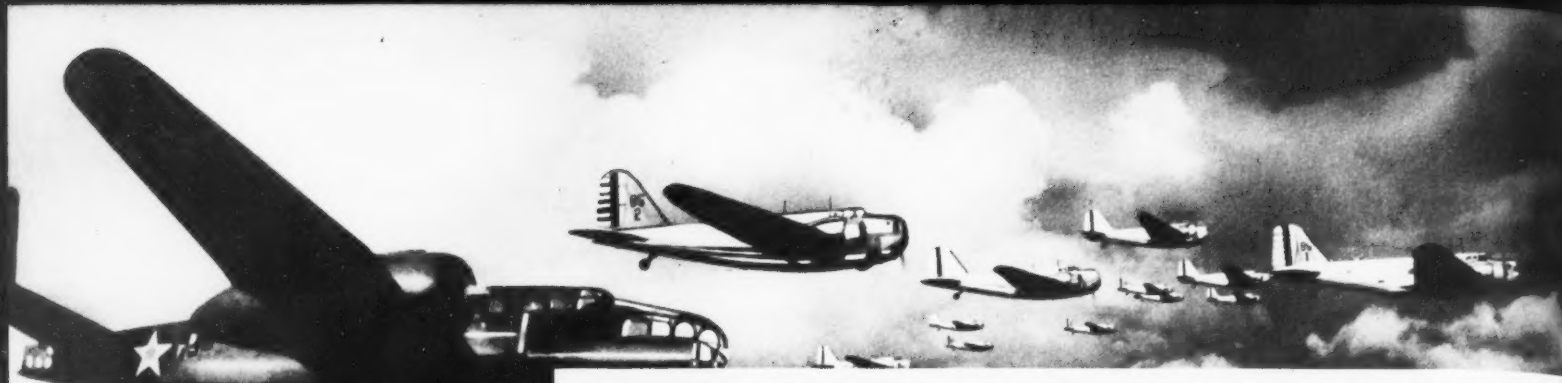
Engineering and Manufacturing
Information Essential to . .

NATIONAL DEFENSE



INDUSTRY AND DEFENSE

THE dissemination of vital manufacturing information is the all-important function of the technical press in the National Defense Program. Industries occupied in the pursuits of peace-time have been suddenly faced with the necessity of producing the implements and weapons of war. In some instances, as in certain branches of the automotive industry which turned to the production of Army automotive vehicles, this switch has been a relatively simple matter. But other branches of the automotive industry as well as sewing machine plants, printing machinery establishments, and many varied companies have been awarded Army and Navy contracts for the manufacture of ordnance of types with which they had no previous experience.

Visualize the thousands of different articles of war made from metal and necessarily turned out by metal-working equipment, and an idea is gained of the terrific volume of manufacturing information which must be published in order to acquaint engineers and production men with the methods and facilities available for this work. Many of these facilities for production of munitions were not in existence in their present form or application two years ago. In 90% of all cases it has been a matter of designing from the ground up; of refitting existing methods to the manufacture of entirely new products. And to cap it all, American Industry has had to do this work at top speed.

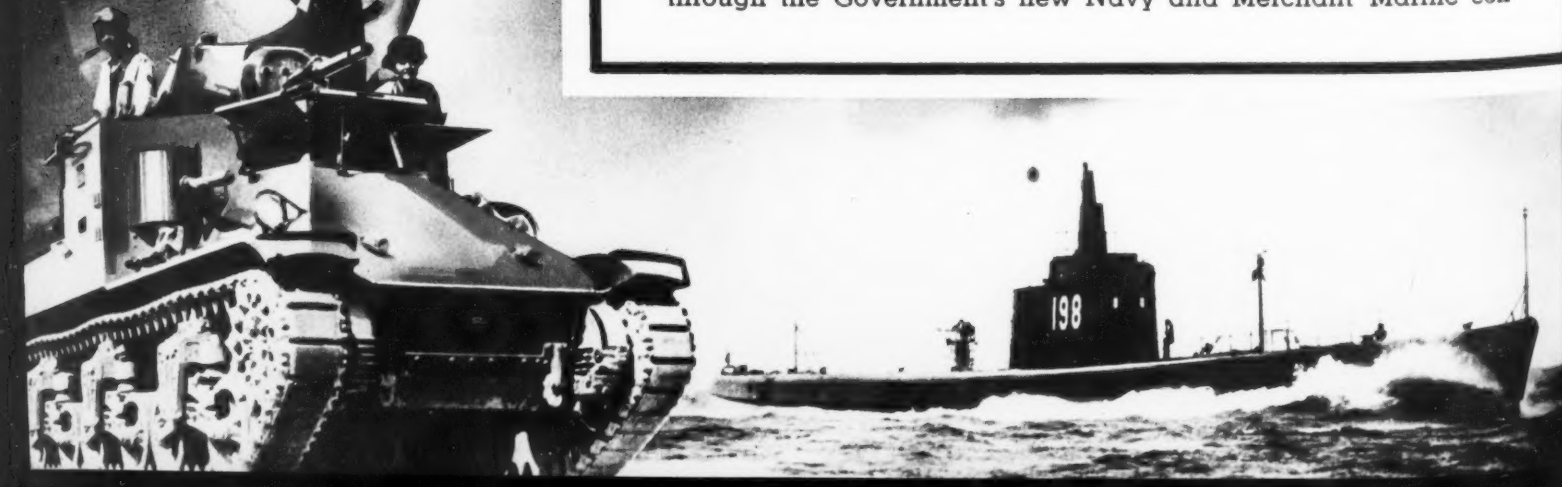
AIRCRAFT IN 1938

In 1938 the greatest volume of aircraft production was in the commercial field. Army and Navy contracts in volume were non-existent. Nevertheless, the aircraft manufacturers, who then specialized in the production of commercial airliners and in the development and manufacture of aircraft engines, had developed a technique which, with comparatively few changes, but great multiplication, could be utilized for turning aircraft manufacture into a mass production industry. Thus the United States, although woefully lacking in aircraft, one of the most costly and yet most necessary items of modern warfare, had a solid foundation upon which to build the gigantic aircraft industry of 1941.

Blending a thought as to the potentialities of commercial air transportation with a look at the world military situation at the time, MACHINERY published in July 1938 its first Aircraft Issue. This issue was devoted exclusively to metal-working technique in the Aircraft Industry. And the information was published at a time when the world was pointing to the security of France behind its Maginot Line!

SHIPBUILDING IN 1938

Also in 1938, shipbuilding came to the attention of the public through the Government's new Navy and Merchant Marine con-



struction program. Metal-working information on the building of ships was meager. Shipbuilding technique was thought of mainly as a riveting job. MACHINERY'S editors visited the leading shipyards, studied shipbuilding mechanical practices and in November 1938 published its first Navy and Merchant Shipbuilding Number. This issue was filled with details of the methods and potentialities of metal-working equipment in shipbuilding. It indicated how many time-honored hand methods were superseded or could be advanced by the application of relatively high-speed metal-working equipment. This issue of MACHINERY became a well-worn volume on the desks and tables of naval officers, executives and engineers connected with the shipbuilding industry and throughout the mechanical industries. It contained timely, usable information available nowhere else in such correlated form.

AIRCRAFT IN 1939

In July 1939 MACHINERY published its second number devoted to Aircraft Production. Two months later Germany marched on Poland and the terrible significance of military aircraft superiority was apparent to the world. The information contained in this issue could not have been more timely, and its value to aircraft manufacturers was proved by the demand which soon depleted the stock of available copies.

During the year that followed, when the Nazi hordes overran Czechoslovakia and the Low Countries, drove the English armies off the continent and occupied France, aircraft was still the major offensive weapon, used to blast the way for the crushing might of the Panzer divisions. In the United States, England and Canada military attention was thus focused mainly on the production of aircraft, anti-aircraft guns, anti-tank guns—with first place given to aircraft.

July 1939 MACHINERY also contained invaluable articles based on munition-making operations in each one of the manufacturing arsenals of the U.S. War Department.

AIRCRAFT IN 1940

In July 1940 MACHINERY published its Third Aircraft Production Number presenting in great detail the mechanical equipment necessary and available for turning out aircraft on a mass production basis which by this time had become imperative.

TANKS IN 1940

By November 1940 the success of Germany's armored divisions had forced the importance of tanks in modern military warfare upon all governments. With foresight, the Government of the United States had already instituted a tank production schedule, and in that same month MACHINERY published one of the most widely read and valuable issues on military production ever distributed:—tank manufacture on a mass production basis, as then achieved by one of the largest American railway-equipment manufacturers.

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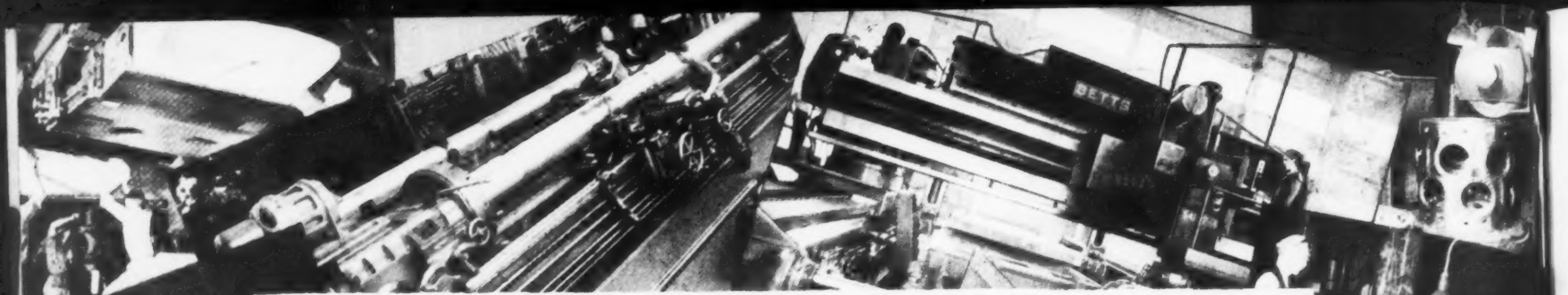

MUNITIONS IN 1941

In January 1941 Canada was the Western Arsenal of the British Empire, having geared itself to a war production economy and having turned most of its production for civil needs to the manufacture of munitions. Canada was so far ahead of the United States at that time that it offered an excellent example for the United States to follow. Hence, in January 1941, with the cooperation of the Canadian Government, MACHINERY published a Canadian Munitions Number. It showed in great detail how Canada's industrial plants were turning out guns, armored vehicles and ammunition of all calibers. This information came at a time when American manufacturers needed all the guidance and help they could get in starting work on their newly acquired Army and Navy munitions contracts.

Just as soon as American plants were in production on shells, rifles, cartridge cases and other munitions, MACHINERY published a series of articles describing these methods, in the April 1941 number.

AIRCRAFT IN 1941

The American aircraft industry was really on a large-scale production basis in July 1941 and the way everything from bombers to trainers to engines was being turned out through modern metal-working practices and mass production methods provided the subject of the July 1941 Aircraft Production Number.

SHIPBUILDING IN 1941

This present issue of MACHINERY — the Navy and Merchant Shipbuilding Number — shows how American Navy Yards and private shipyards are answering the Axis challenge in the Battle of the Atlantic. Ships and still more ships are the urgent need and presented here are examples of how America's leading shipyards are using the latest metal-working equipment and methods to break all records in ship launchings. The information contained in this number is a timely aid to all engineers and production men who have a part in the greatest shipbuilding program of all time.

BACKBONE OF DEFENSE

MACHINERY'S part in the Defense Program is to provide the "know how", the information so necessary to produce the thousands of metal parts and products comprising munitions and armaments—Army and Navy requirements of all kinds. Through its special features it has focused attention on the needs of the moment, and in its regular numbers has carried on the task of providing the bedrock mechanical information required by the metal-working industry—the backbone of Defense. Only through such a medium can there be an efficient exchange of ideas and MACHINERY has presented these ideas in timely, practical and usable form.

Erik Oberg

Editor

Mechanical Engineers' Meeting in Louisville

CONSIDERING the feverish activities in the defense industries and the difficulty that many engineers have in leaving their work, even for a brief period, the meeting of the American Society of Mechanical Engineers held in Louisville, Ky., October 13 to 15, was well attended. The subjects covered in the program were of the most varied interest. As was to be expected, many of the papers related to national defense. The interest in this subject was further augmented by the exhibit of ordnance materiel arranged by the Cincinnati Ordnance district office.

Continuing the theme of the address by William L. Batt, of the Office of Production Management, at the annual dinner last December, Walter White, assistant to the chairman of the Business Advisory Council for the Department of Commerce, spoke at the management luncheon October 14 on the subject "Free Enterprise and World Politics."

Education and training had been given a prominent place on the program. A valuable paper was that presented by F. E. Brooker and John W. Barrett on "Motion Picture Studies of Machine Shop Operations and Practice, and Visual Aids for Defense Training."

Since this meeting aroused the interest of a great many engineers from the South, particular attention was given to the wood industries. The subjects of hydraulic, steam, oil, and gas power; fuels; and smoke abatement were also thoroughly covered. Among other subjects dealt with were rubber, plastics, and aviation.

The Machine Shop Practice Division held two sessions. At one of these, Irwin Loewy read a paper on "Modern Methods of Shell Forging and Auxiliary Equipment," and F. T. Chestnut presented a paper on "Induction Heating in Defense." At the other, M. F. Judkins read a paper on "The Manufacture of Shells," and W. P. Bearce on "Industry Aids the Arsenals."

Tool Engineers Hold Semi-Annual Meeting

THE semi-annual meeting of the American Society of Tool Engineers was held at the Royal York Hotel, Toronto, Canada, October 16 to 18. The theme of the meeting—"The Tool Engineer Turns to War Production"—was dealt with from many angles in the papers presented. Thursday evening, October 16, a technical session was held dealing with old machine tools versus new. At this session, Arnold Thompson, president of the Tool Engineering Service, Toronto, Canada, read a paper on "Adapting Old Tools for Precision Production in an Emergency." Fred Dull, vice-president of the Monarch Machine Tool Co., Sidney, Ohio, read a paper entitled "Modern New Machine Tools — Advantages in Costs and Efficiency."

The session held Friday afternoon, October 17, was devoted to the general theme "Getting the Most Out of Cutting Tools." At this session, Roy T. Wise, deputy machine tools controller, Department of Munitions and Supply, Ottawa, read a paper on "Making the Best Use of Cutters." Philip M. McKenna, president of the McKenna Metals Co., Latrobe, Pa., covered the subject "Carbide Cutting Tools." The "Proper Use of Cutting Oils" was dealt with by Walter Esau of the E. F. Houghton Co., Philadelphia, Pa.

Frank W. Curtis, President of the A.S.T.E.

"Training Personnel" was the subject of the Saturday morning session, October 18, at which Roy M. Sherk, director of war emergency classes at the Western Technical-Commercial School, Toronto, Canada, read a paper entitled "The School's Task." Edward Kennard, plant manager of St. Catharines Steel Products, St. Catharines, Ontario, spoke on "The Industry's Task." At the semi-annual dinner held Saturday evening, Honorable C. D. Howe, minister of Munitions and Supply of the Canadian Government, spoke on the extent of Canada's wartime accomplishments.

Arrangements were made for the members of the Society to visit twelve of the foremost munitions and armament plants in the Toronto district. During these visits, some outstanding achievements were seen.

EDITORIAL COMMENT

At this critical time in the history of our country, clear thinking is necessary on the part of public officials to inspire the nation with confidence in the Administration. Unfortunately, there have recently been some cases of muddled rather than clear thinking on one of the most important problems now facing the nation as a whole—the problem of stabilization of prices.

Muddled Thinking is Dangerous in These Critical Days

The Secretary of the Treasury, Mr. Morgenthau, believes that there should be a ceiling on "profits" in industry, but does not think it necessary to restrict unduly rising wages. This does not seem logical, since some labor leaders have proved that, by threats of strikes that will hold up production in defense industries vital to the welfare of the nation, it is possible to increase wages, step by step, to levels that are not compatible with a policy of fixed prices.

The Administrator of Price Control, Leon Henderson, advocates definite control of prices, but no control of wages, although wages are the most important part of the price of commodities. Just how one can be controlled without interfering with the other is a problem, the solution of which appears to be impossible.

It is difficult in these days to discuss such subjects in an honest and straightforward manner without being accused of being biased. Anything that is said against uncontrolled increases in wage rates is interpreted by many as a statement unfriendly to labor. But that is, in itself, a very biased attitude. Labor is entitled to its share of the value of that which is produced, just as much as management and capital. But when it is intimated that it is possible to limit the prices of products without setting any limit to wages, which constitute the most important factor in the price of these products, then men who try to think clearly and honestly are baffled; because prices and wages must be controlled together, or they must be permitted to skyrocket together. Wages are an inseparable part of cost and price. They determine prices and are also determined by prices.

Wages are an Inseparable Part of Costs and Price

Mr. Morgenthau makes the common error of saying that there is a fundamental difference between commodity prices and personal services; but in this he is mistaken. Men who work either chiefly with their hands or chiefly with their brains do not sell themselves, but only their services; this applies equally to the professional man, the farmer, the retail merchant, the manufacturer, and the laborer. All of them simply sell their services to someone else. It is impossible to separate the price of the service from the price of the finished product into which this service enters.

Honest Examination of the Facts is Not Unfriendly to Labor

The price of the finished automobile, for example, is simply the sum total of a long chain of services—the service of the miner who digs the ore; of the steel mill worker who produces the steel for the car and of the textile worker who helps to produce the upholstery; the service of the men in the automobile shops who perform the machining operations and of those who do the assembly work; and so on. The services of all these people enter into the price of the car, and the cost of the car depends to a large extent upon the wages or salaries paid to all these people.

To point out this fact is not to advocate low wages. Automobile manufacturers, for example, are the last who would profit by low wages, because high wages in proportion to prices of cars insure a good market for cars. But the relationship cannot be changed at will.

This relationship between wages and prices has been pointed out here in order to counteract the muddled type of thinking that has characterized so many utterances on the subject. Let us try to be fair, to have open minds, and to see things as they are. To do that is not to be unfriendly to labor. High wages are the greatest assurance of good markets and of good business; but, none the less, wages must be in proportion to services rendered—that is, in proportion to the price of the product that labor helps to produce.

Machine Tool Builders Pledge Unlimited Defense Effort

AT the fortieth annual convention of the National Machine Tool Builders' Association, held at Edgewater Beach Hotel in Chicago, October 13 and 14, a resolution was unanimously passed pledging the Association's aid in the defense effort to the utmost, and specifically referring to the fullest use of two and three shifts in shop operation, training of operators, and extending working hours just as far as possible.

Photo Greystone Studios

Clifford S. Stilwell, New President of National Machine Tool Builders' Association

The convention was unusually well attended. The opening address by the president of the Association, Frederick V. Geier, president of the Cincinnati Milling Machine Co., on the subject "Machine Tools Meet the Emergency," outlined comprehensively what this industry has done to meet the extraordinary demand for machine tools. "From the low point of shipments of $25,000,000 eight years ago," said Mr. Geier, "we are this year building up the output to the almost unbelievable peak of $750,000,000. During the decade of the 1930's our pleas that the defense facilities of our country be rebuilt and re-equipped were largely unheeded, and the industry-wide capacity then available remained largely unused. To some, at least, it was becoming increasingly clear that the peace and safety of nations was coming to depend more and more on national readiness to forge from industrial resources the weapons for national protection and defense. Now, after two years of war abroad, it has at last become crystal clear that machine tools are the prime prerequisite for industrial production of vital defense materiel, as the first requirement for national safety.

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Frederick V. Geier, Retiring President of National Machine Tool Builders' Association

"If we turn to the question 'Have machine tools met the emergency?' the answer is definite and clear-cut. A brief review of the past year will suffice. All of us remember that not until September of last year did the American orders for machine tools definitely exceed the rate of production at which the industry was running. At that time, the basic Defense Program had just been approved by Congress, and the official estimate of total machine tool requirements for defense was set at $386,000,000, an over-all volume of production actually delivered by the industry within eight months. The then estimated British Empire requirements of $154,000,000 for the whole of 1941 was equivalent to the additional production of the industry only to the middle of July this year.

"The readiness of the industry to provide so large a volume of equipment was directly traceable to the far-sighted steps taken many months before to prepare for just such an emergency. When, last September, defense orders for machine tools first began to be placed in volume, over 2,400,000 square feet of additional floor space and the necessary machine tool equipment had been completed during the preceding twelve months by sixty-seven companies in the industry, acting on their own initiative and with

their own funds. Fifteen other companies then had under way 1,400,000 square feet of additional floor space, and seventeen companies had expansion programs of unreported amounts.

"Another significant index of how the industry has met the emergency is revealed in the fact that 130 companies received 247 Certificates of Necessity for plant and equipment expansion subsequent to June 10, 1940, amounting to $53,537,402, again utilizing their own resources. This does not include the more recent expansions of twenty-seven companies employing Government emergency plant facilities contracts for $23,499,649. The report from the membership indicates that thirty-nine firms are still in process of adding to building capacity, and sixty-four to productive equipment.

"From the $25,000,000,000 basic Defense Program of a year ago to the $63,000,000,000 total of today is a far cry. World-wide events have created this condition, and we understand why the Defense Program was not and, perhaps could not, have been planned as a whole. As a result, of course, it has not been possible for us to learn well in advance what the needs for machine tools would actually be, and yet the industry has met every need, as it arose, in remarkable degree. Even though it usually requires from six to twelve months' time in process to build the important machine tools, the cases where production could not commence because the new machine tools were not on hand have been few indeed. Far more frequently the machine tools have been delivered to defense plants well in advance of the time they could actually be put into production.

Increased Employment in the Industry

"The story of what the industry has done to accomplish this is familiar enough to many, and yet I feel sure that few realize how far the industry has advanced. Just over two years ago, 110 firms in the industry, accounting for 90 per cent of the employment, had 44,000 men. In September, 1940, this had risen to 68,000, and last month to 92,000. Despite this great increase in employment, the industry still has over 12,000 men in training.

"Of the employes in the industry, 99.12 per cent are in plants on a two- or three-shift basis. By February of this year 40 per cent of the employes were in three-shift plants, and by last month the three-shift basis had further increased to 53 per cent of all employes in the industry. Of the plants, 87 per cent are working over 100 hours and up to 168 hours per week. The National Industrial Conference Board reports that the average number of hours worked in machine tool shops is the highest in American industry. If there is any better general record of full utilization of key equipment, it has yet to be disclosed.

"There has been a great increase in the amount of work sub-contracted during the past year; eighty-nine firms are now sub-contracting parts, units, or complete machines in an amount exceeding 25,000,000 man-hours a year. Six months ago, fifty-six kinds of machine tools were being completely sub-contracted by twenty-eight machine tool companies. Today the number of companies has risen to thirty-six.

"The increase in capacity of existing plant and the widespread sub-contracting by members of the industry has been supplemented by the output of a variety of new sources. In five important machine tool groups alone, in addition to the fifty-four pre-war builders, there are now forty-five new sources. For all types of machine tools, there are at least seventy-two new machine tool producing sources other than the sub-contracting sources previously mentioned. The industry has been quick to encourage and assist in the development of these added sources.

"We can be proud indeed of what our industry has accomplished in the last twelve months," concluded Mr. Geier. "When we contrast the $25,000,000,000 Defense Program of last year with the $63,000,000,000 goal of today, when we call the roll of countries conquered and industrial capacity captured and destroyed, when we reckon the dwindling resources available to the democracies in their battle for survival, we know that our task has just begun. This, as twenty-five years ago, may be our last meeting before we face the grim necessity that America must exert its last ounce of effort. Let us renew our pledge: Tell us the needs and we will deliver the tools."

Another outstanding address was made before the meeting by Mason Britton, Chief of Tools Section, Office of Production Management, Washington, D. C., the subject of which was "Machine Tools for Defense." This stirring address called upon industry and upon American citizens in general to do their utmost in this world crisis that threatens the very foundations of our liberties and our way of life; this war is our fight and we must recognize that fact.

The text of the resolution adopted at the closing session of the convention, which was introduced by Ralph E. Flanders, president of the Jones & Lamson Machine Tool Co., was as follows:

Whereas the machine tool industry, conscious of its responsibility for serving the National Defense, increased its production in 1940 from $225,000,000 of output to $425,000,000, and has pledged itself in 1941 to $750,000,000 of output and so advised Mr. Knudsen in January, and

Whereas this has been accomplished by an ever growing volume of sub-contracting of parts

and complete machines, and by the training of men for second- and third-shift operation on the critical tools to the point where more than a half of all its employes are now at work in plants operating on a three-shift basis, and

Whereas Mr. Knudsen . . . still further asks us to increase wherever possible the man-hours on night shifts, to develop sub-contracting to the greatest possible extent, and to work critical tools seven days a week, therefore:

Be it resolved that we will expand to the fullest extent the day and night operation of those critical tools on which the output of our shops depends, and that we will continue with full diligence to expand the volume of our sub-contracting of parts and complete machines of all the critical types, and that we will expand this critical production to the fullest possible extent by Sunday work; but, in view of the fact that, in general, none but those industries in which continuous operation is a physical necessity are now so working, and . . . that attempts to operate seven days a week have met with the obstacles of state laws, and sincere religious conviction, therefore:

Be it further resolved that, in view of this request, we, in turn, request of the national administration that it give increasing attention, in its public statements and its policies toward labor and the general public, to strengthening such a sense of national unity as will make it possible for us and for all other co-workers in the great undertaking to use our skill, experience, energy, and ability to the limit, whether by seven-day operation or by any other practical means whatsoever.

The Machine Tool Builders of the United States will do their duty.

New Officers Elected

Clifford S. Stilwell, executive vice-president of the Warner & Swasey Co., Cleveland, Ohio, was elected president of the Association. Other officers elected were: First vice-president, George H. Johnson, president, Gisholt Machine Co., Madison, Wis.; second vice-president, John S. Chafee, vice-president, Brown & Sharpe Mfg. Co., Providence, R. I.; and treasurer, E. C. Bullard, vice-president, Bullard Co., Bridgeport, Conn.

Three new directors were elected for a three-year term: John S. Chafee, vice-president, Brown & Sharpe Mfg. Co., Providence, R. I.; E. Blakeney Gleason, vice-president, Gleason Works, Rochester, N. Y.; and Albert H. Eggers, sales manager, Greenlee Brothers & Co., Rockford, Ill. Tell Berna continues as general manager and Mrs. Frida F. Selbert as secretary of the Association. Richard H. Abbott was made assistant to the general manager.

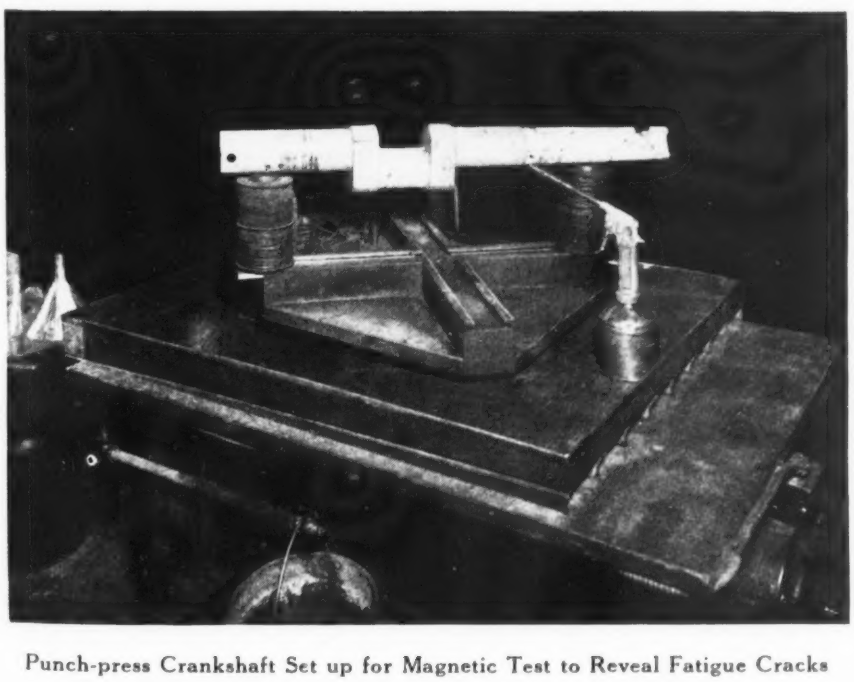
* * *

A Fool-Proof Test for Cracks in Crankshafts

Power presses, recognized as one of the most hazardous groups of industrial machines, are given careful periodic tests at the General Electric Co.'s Schenectady Works. One of the tests to which punch-press crankshafts are subjected is a magnetic one.

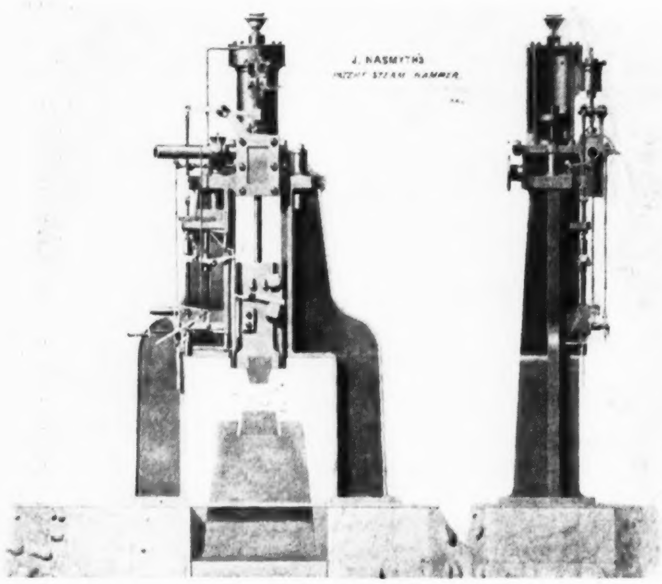
This test consists of magnetizing the shaft, making the direction of the flux longitudinal, so that it will intercept any possible cracks at right angles. While magnetized, the shaft is sprayed with kerosene, which has in suspension finely divided particles of magnetic iron oxide. Any cracks or breaks in the metal will set up magnetic poles, which are strong enough to attract and hold the iron-oxide particles, thereby outlining a crack which would ordinarily be invisible to the naked eye.

This test is made each time a shaft is removed from a punch press for any reason, as a punch-press crankshaft is subjected to tremendous strain in operation. One large company recently tested a group of forty-three crankshafts by this method, and found that fourteen of them were cracked and required replacement.



Punch-press Crankshaft Set up for Magnetic Test to Reveal Fatigue Cracks

Original Drawings of Historic Machines

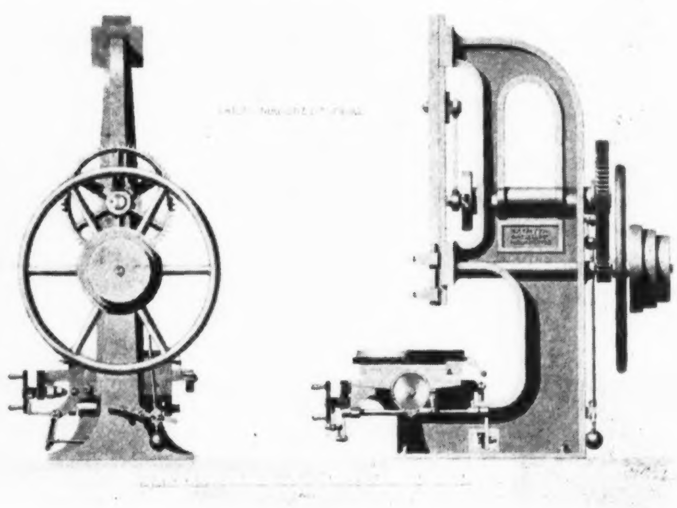


THE accompanying illustrations show photographic reproductions of original drawings of early machine developments. The Institution of Mechanical Engineers, of London, England, has presented to the Chambersburg Engineering Co., Chambersburg, Pa., maker of forging hammers, presses, etc., the original drawing of Nasmyth's "patent steam hammer," as well as two other drawings of Nasmyth developments.

The steam hammer drawing, Fig. 1, is dated January 4, 1844; the vertical slotting machine in Fig. 2, known as a "paring" machine, is dated February 7, 1849; and the horizontal steam punching and shearing machine, Fig. 3, is dated June 15, 1853.

These drawings were made before the days of photography and the airbrush, but they have all the smoothness and detail in highlighting and shading that could be produced in a modern airbrush drawing or in a retouched photograph.

In presenting the drawings through the American Embassy to the Chambersburg Engineering Co., the secretary of the Institution of Mechanical Engineers wrote: "The Institution is glad to make a gesture of international goodwill by the presentation of these historic drawings."



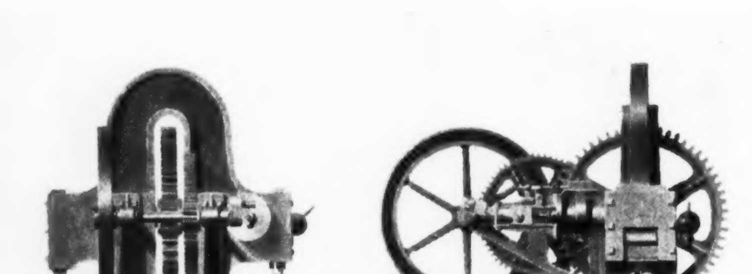


Fig. 1. (Above Left) Colored, Shaded, and Varnished Drawing of the James Nasmyth Steam Hammer which was Patented in 1843. The Drawing is Dated January 4, 1844

Fig. 2. (Above Right) The Nasmyth Vertical Slotting Machine Known as a "Paring" Machine. The Original is a Colored Drawing Mounted on Linen. It Bears the Date February 7, 1849

Fig. 3. (Left) Nasmyth Steam Punching and Shearing Machine Reproduced from a Colored Drawing, Shaded, and Mounted on Linen, Bearing the Date of June 15, 1853

Munitions Cleaning—1941 Style

A Review of the Methods and Solvents Applicable to the Cleaning of Shells, Cartridges, Guns, Rifles, and Other Materiel—Fourth of a Series of Articles

By Dr. R. W. MITCHELL, Technical Director
Magnus Chemical Co., Garwood, N. J.

IN the first three articles of this series, the various methods and solvents used in the cleaning of shells and cartridge cases were considered. The present article deals with the cleaning of percussion fuses and aluminum fuse parts, and discusses some general problems relating to the cleaning of ordnance and materiel.

Percussion fuses for all types of shells involve a number of cleaning operations. Cleaning must be thorough and rinsing completely satisfactory, not only because the same rigid standards of lacquer adherence apply to all shell parts that are lacquered, but because the functioning of fuses requires a precision in operation that does not allow for any but absolutely clean surfaces on all parts. Even the most minute particles of dirt or foreign matter can interfere with the proper functioning of a fuse; for example, the shutter, which is moved by centrifugal force during the flight of the shell to allow the firing pin to explode the shell on impact, must be absolutely free to function. A very small particle of dirt can prevent the shutter from functioning properly.

Modern fuse parts include steel, brass, bronze, and aluminum. As a rule, cleaning is done on the individual units after machining, although the assembled parts of brass and steel are often cleaned again as a final precaution. As far as steel, brass, and copper are concerned, the same mild alkaline cleaner recommended for the final cleaning of shells, shell cases, and small-arms cartridge cases is well suited to fuse parts. Its speedy wetting and penetrating action, with accompanying emulsification of greases and oils, insures rapid cleaning, while its thorough rinsing qualities assure completely cleaned metal surfaces. Freedom from tarnishing of brass and copper also recommends this particular cleaner for work on fuses, of which the utmost in precision and appearance is demanded.

The work is usually done in wire baskets or racks, being dipped and agitated in a still tank of the hot solution, followed by a rinse in clean warm water to speed up drying. Those parts that have recesses tending to entrap liquids, or that are likely to nest and thus form traps, should be racked or packed to avoid such retention of either cleaning solution or rinse water. The emulsifying solvent cleaning method previously described can be effectively used on such cleaning operations. A paddle type washer which keeps the units being cleaned constantly turning over at a slow speed, without danger of damage, will serve this purpose, both for cleaning and subsequent pressure spray rinsing.

Cleaning Aluminum Fuse Parts

Aluminum fuse parts require a different type of cleaner from the alkaline material used on shells and cases. The emulsion type cleaner is effective in most cases, and in view of the simplicity of its application, should be tried on a small scale to determine whether the types of cutting and forming dirt that have to be removed from aluminum parts will respond to this kind of cleaner. When it can be used, much trouble and uncertainty can be avoided.

When conditions make the use of the emulsion type cleaner inadvisable, a special type of cleaning material suited to aluminum must be used. There are a number of such compounds, but perhaps the most suitable is a special high-titer potash soap, in the form of a stiff yellow paste, which has been highly effective in removing buffing and polishing compounds from aluminum and its alloys. This soap emulsifies the greases, waxes, and other constituents of the forming lubricants, as well as of any polishing compounds used, and disperses the abrasive and fine metal particles to provide a physically clean surface. Rinsing is speedy and complete, and no tarnishing or discoloration of the aluminum or its alloys results. Cleaning is done in much the same manner as on other fuse parts, using wire baskets or racks in still tanks.

Cleaning Problems on Ordnance and Materiel

So much for the cleaning of munitions proper. But what about materiel and ordnance? Defense construction is essentially a problem in metal

production. What about tank parts, track units, rifles, machine guns, artillery, searchlights, range-finders, aiming circles, caissons, clips, mess kits, surgical instruments—all the metal parts, large and small, that are needed when a nation arms itself on a real scale? These metal pieces include all kinds of metals, all sizes and all finishes. Individual cleaning problems vary widely, and it is impossible to cover them in detail in the space of such an article as this.

However, it can be said that these cleaning problems are not new. Nor are they changed because they are concerned with war supplies. They are the same old problems of metal pre-cleaning and cleaning, whether the unit is to be used for war or for peace. Generally speaking, without particular reference to the type of metal involved or the shape of the piece, there are two main phases of the cleaning problem. The first is a precleaning operation for the removal of surface dirt—grease, oil, smut, pigments and abrasives, or spacing agents, such as lithopone, lime, emery, crocus, tripoli, rouge, etc. The purpose of the precleaning operation is to produce a physically clean surface; that is, a surface from which gross surface dirt has been removed —all such dirt as could be wiped, brushed, or scoured off—but one that has not been cleaned beyond this point to a condition which is called chemically clean. In other words, a physically clean surface has not been made clean to the point where it is free of "water break," nor has it been cleaned of all impurities in its microscopic surface fissures or irregularities.

For the purpose of materiel production, a physically clean surface is all that is required, unless the part or object has to be plated or finished with a vitreous enamel. In that case, a chemically clean surface is essential. A properly organized cleaning process that will give a good physically clean surface is sufficient for most operations where painting, lacquering, and similar finishes are involved.

Importance of Precleaning

When a chemically clean surface is needed, particularly for plating, precleaning is of vital importance, because it is not easy to reach a chemically clean surface condition in one operation without having first obtained a physically clean one. Precleaning is of vital importance, therefore, not only because so much materiel calls for painted or lacquered surfaces, but because plated surfaces are also in wide demand.

The job precleaning has to do is made complex by the multiplicity of ingredients in modern buffing and polishing compounds, cutting lubricants, coolants, and the like. Removal of a simple mineral grease or abrasive particles may be easy enough, but when many of the modern sulphurized or chlorinated oils, waxes, and metallic soaps are involved, the problem immediately becomes difficult, particularly in view of the essential requirement that adhesive solid particles must be removed. If the oil or grease itself is intractable, as far as the cleaning operation is concerned, poor results are likely to be had in removing these solids.

Vapor degreasers are in wide use for pre-cleaning, quite successfully in many cases. Their limitation, besides that of high operating cost, is that the solvent can remove only those greases and oils that it dissolves. It can remove only those solid particles embedded solely in grease or oil, and does not touch those solids adherent to the metal.

As for metal cleaners used in conjunction with precleaning, proper selection will insure satisfactory results in still tanks or washing machines. The important element in such cleaners today is the wetting agent, which insures speedier wetting and penetration of the work, more thorough dispersion (where the proper type of agent is used) and much more thorough and rapid rinsing. The drawbacks of alkaline cleaning are the effects on the metal, where staining and tarnishing are possible and, of course, the effects of these cleaners on the skin and hands of workers.

* * *

Price Reductions on Aluminum

At a time when so much is being said about rising prices, it is of interest to note that the Aluminum Co. of America has announced a reduction in the ingot price of aluminum from 17 to 15 cents per pound on shipments made after September 30. Reductions will also be made in the price of fabricated aluminum in conformity to the ingot price reduction. This price reduction is the fourth in eighteen months, prior to which the price of aluminum was 20 cents a pound. The present reduction in price is made in anticipation of the economies in the mass production of aluminum which will be possible in the new plants that are being erected.

Since the great bulk of the output of the Aluminum Co. of America is used for national defense purposes, the principal beneficiary of these price reductions will be the United States Government.

* * *

The McKenna Metals Co., Latrobe, Pa., reports that, during the last twelve months, production of carbide tools of the grades made by the company has increased 500 per cent. Notwithstanding this increase, it is expected that by December, present production will be doubled.

MACHINERY'S DATA SHEETS 453 and 454

TYPICAL APPLICATIONS OF S A E STEELS—3

This listing, based on the 1941 S A E classification of steels, is not intended to be complete, but rather to indicate by typical examples what steels are suitable for various types of applications.

Casehardened Parts

Low-carbon steel No. 1020 is a standard carburizing grade. It does not respond materially to heat-treatment unless carburized or cyanided.

Low-carbon steel No. X1020, a higher manganese variant, has improved machining and hardening properties and carburizes and hardens freer from soft spots.

Low-carbon steel No. 1025 is not regarded as a carburizing grade, but is suitable for casehardening where core hardness is desired, or for parts of large section.

Low-carbon steel No. X1025, a high-manganese variant of steel No. 1025, provides improved machinability and physical properties.

Low-carbon steel No. 1030 can be used for forged, machined, or cold-worked parts requiring higher properties than are obtainable with the lower carbon steels. It is suitable for casehardening where core hardness is desired or for large sections, but does not come within the carburizing steel classification.

Free cutting steel No. 1112, known as "screw stock," may be carburized and cyanided, but open-hearth steels are recommended when heat-treating is necessary.

Free cutting steel No. 1115, known as "open-hearth screw stock," is more dependable for use in casehardened parts than steel No. 1112.

Free cutting steels Nos. X1314 and X1315 are used extensively for casehardened parts where superior machining properties are desired. For drastic quenching of light sections where core toughness is essential, steel No. X1314 is preferred.

Nickel steel No. 2315 is intended primarily for carburizing. It has low critical points and case quenches to file-hardness in oil.

5 per cent nickel steel No. 2515 is one of the most dependable of structural steels, and is used for carburized parts requiring exceptionally tough cores after heat-treatment. It will not give the surface hardness of some other steels due to retained austenite. When excellent core toughness is required, the carbon content should be held to 0.17 per cent maximum, and the steel is then identified as No. 2512.

Nickel-chromium steels Nos. 3115 and 3120 are intended primarily for carburized parts. More responsive to heat-treatment than the carbon steels.

Nickel-chromium steels Nos. 3215 and 3220 are intended primarily for carburized parts requiring a greater strength of core than is obtainable in steels Nos. 3115 and 3120. A higher alloy content gives them deep hardening characteristics and makes them more desirable for structural parts of heavy sections. No. 3220 should be used only for massive sections.

Nickel-chromium steel No. 3312 is intended for carburized parts when a core having a very high strength and toughness is desired.

Nickel-chromium steel No. 3415 is intended for carburized parts when a core having very high strength and toughness is desired.

Molybdenum steels Nos. 4615 and 4620 are used for carburized gears, shafts, and other parts where high fatigue resistance and tensile properties are desired.

Molybdenum steels Nos. 4815 and 4820 are used interchangeably with 5 per cent nickel steel for various carburized parts and have excellent core and surface hardness and good wear resistance.

MACHINERY'S Data Sheet No. 453, November, 1941

TYPICAL APPLICATIONS OF S A E STEELS—4

This listing, based on the 1941 S A E classification of steels, is not intended to be complete, but rather to indicate by typical examples what steels are suitable for various types of applications.

Clips, Spring

Medium-carbon steel No. 1040.
Medium-carbon steel No. 1060.

Clutch Disks

Medium-carbon steel No. 1060.
Medium-carbon steel No. 1070.
High-carbon steel No. 1085.

Clutch Fingers

Low-carbon steel No. 1020, a standard carburizing grade.

Low-carbon steel No. X1020, a higher manganese variant, has improved machining and hardening properties, as compared with steel No. 1020. It carburizes and hardens freer from soft spots.

Coil Springs, See Springs

Cold-Headed Parts

Low-carbon steels Nos. 1010 and 1015 are used in cold-heading wire for tacks, rivets, etc.

Medium-carbon steel No. 1035 has moderate physical properties. A major application is wire and rod used for cold-upsetting; such steel usually has a carbon content ranging between 0.30 and 0.38 per cent.

Chromium-nickel austenitic steel No. 30905, a low-carbon steel, is recommended for the manufacture of articles produced by cold-heading when maximum softness and ductility are required.

Chromium-nickel steel No. 30915, a higher carbon type than steel No. 30905, is recommended for parts that must have a slightly higher tensile strength.

Connecting-Rods

Medium-carbon steel No. 1040 has fair machining properties and deep-hardening characteristics.

Nickel-chromium steel No. X3140.

Chromium-vanadium steel No. 6135 is a steel of medium-carbon grade.

Corrosion-Resistant Parts

Chromium-nickel austenitic steel No. 30805 is recommended for use in parts where unusual resistance to salt water corrosion is necessary.

Stainless chromium iron No. 51210 is used for general stainless applications in both annealed and heat-treated conditions, but is not as resistant to corrosion as steel No. 51710.

Stainless chromium iron No. 51310 is capable of tempering to a higher hardness than steel No. 51210. It is used in the form of temper strip or wire and in bars and forgings for heat-treated parts.

Stainless chromium iron No. 51335 is capable of heat-treating to a relatively high hardness. It is used for cutlery and hardened pump shafts.

Stainless chromium iron No. X51410 is used for the manufacture of parts produced in automatic screw machines.

Stainless chromium iron No. 51710, a high chromium type, is not capable of heat-treatment. It is recommended for formed or pressed parts.

Covers—Clutch, Oil, Transmission, etc.

Low-carbon steels Nos. 1010 and 1015 are available in deep drawing strip.

MACHINERY'S Data Sheet No. 454, November, 1941

Gear Manufacturers Discuss Design Problems in Chicago

THE twenty-fourth semi-annual meeting of the American Gear Manufacturers Association, held at the Edgewater Beach Hotel October 20 to 22, was well attended, as usual, by both executive and engineering representatives of the member companies. According to the usual practice at the meetings of this Association, a great deal of attention was given to the technical side of the industry, especially to standardization problems. The meeting was opened Monday afternoon, October 20, by W. P. Schmitter of the Falk Corporation, Milwaukee, Wis., president of the Association, who made a brief address on the work of the Association and its present pressing problems. Progress reports were then presented by the technical and commercial committees.

Among other subjects, a proposed basis for the preparation of a recommended practice for gear steels was discussed. Another topic discussed was "Recent Gear and Roller Tests," and the subject of lubricants was also given considerable attention. One of the important sessions of the meeting was a symposium on gear tooth strength, presented by the General Standardization Committee, of which T. R. Rideout, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is chairman. At this session, A. H. Candee of the Gleason Works, Rochester, N. Y., presented an address entitled "Calculated Bending Stress in Spur Gear Teeth."

Among other addresses presented before the meeting should be mentioned "Photoelastic Study of Stresses in Spur Tooth Fillets," by T. J. Dolan and E. L. Broghamer, of the University of Illinois; "Geometrical Determination of Tooth Form Factor," by A. H. Candee, Gleason Works, Rochester, N. Y.; "Facts and Fallacies of Stress Determination," by J. O. Almen, General Motors Corporation; and "Priorities," by Warren G. Bailey, Office of Production Management, Regional Office, Chicago, Ill.

National Metal Congress and Exposition

THE 1941 Metal Congress and Exposition was held in Philadelphia, October 20 to 24. The exposition was the largest that has been held during the twenty-three years that these expositions have been staged. Considerably more than 100,000 square feet of actual exhibition space was occupied by exhibitors representing every branch of the metals industries.

The welding industry was represented by practically all types of welding equipment—electric arc, spot, and resistance welding machines, and gas welding and cutting equipment. Other extensive displays included heat-treating furnaces—electric, gas, and oil heated—all types of tool steel, stainless steel, corrosion-resistant alloys, and structural steel. In the non-ferrous field, aluminum and its alloys, magnesium, copper, brass, bronze, zinc die-casting metals, etc., were on exhibition. Machinery for die-casting, wire-drawing, and spring-forming was shown. Among the other exhibits were testing equipment, temperature recording and control equipment, almost all types of metal-cutting tools, plating equipment, X-ray equipment, safety appliances, sand-blast equipment, machine parts, lubricants, and coolants.

The Metal Congress, held in conjunction with the exposition, included the extensive technical programs of the American Society for Metals, the American Welding Society, the Wire Association, and the Iron and Steel Division and the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers. About sixty papers were presented before fourteen sessions of the American Society for Metals. Approximately an equal number were presented before the American Welding Society, in its general sessions and before its research groups. Many of the papers dealt specifically with national defense manufacturing problems. Thirteen special defense sessions were held, at which more than 100 engineering and metallurgical specialists presented papers or conducted discussions.

* * *

The twelve-cylinder V-type Allison aircraft engine has over 7000 parts, all of which are machined to great accuracy. The average number of inspections per part is 10, making a total of 70,000 inspections on each engine.

Single-Spindle Semi-Automatic Lathe with Interchangeable Tool-Heads and Stop-Drums

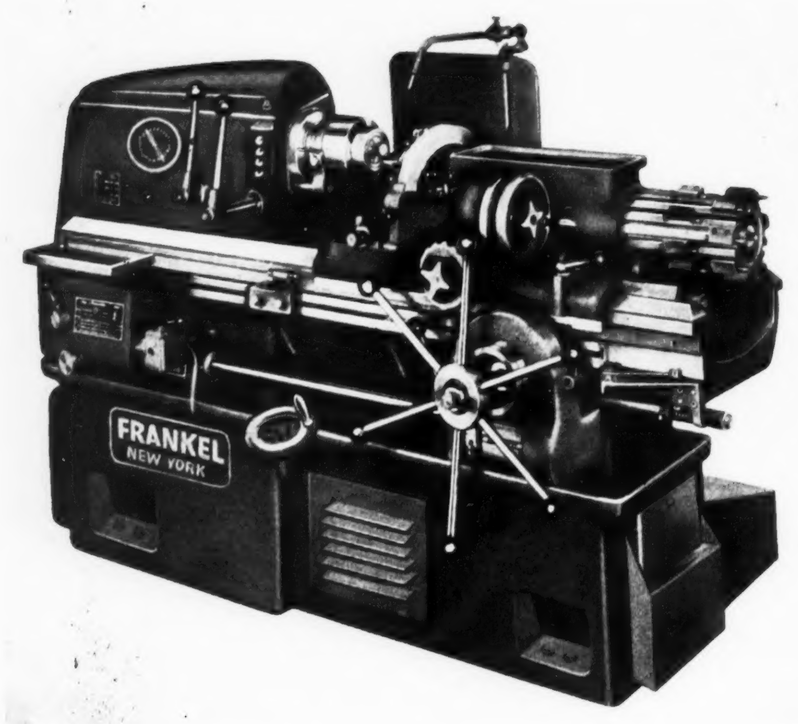


Fig. 1. Single-spindle Semi-automatic Lathe with Horizontal Tool-head on which Multiple Tool-plates can be Quickly Interchanged

INTERCHANGEABLE tool-plates and stop-drums can be employed on a single-spindle, multiple-tool, semi-automatic lathe brought out by the Frankel Machinery Corporation, 118 E. 28th St., New York City. The interchangeable tool-plates and drums of this machine permit the entire tool set-up to be changed quickly for machining different pieces. This is an important factor in production work, as it provides for quick replacement of dull tools with a sharp set.

The outstanding feature of this lathe is the tool-plate or turret, which is revolved or indexed around a horizontal instead of a vertical axis as in conventional design. Successive tools are brought into the operating position by indexing the horizontal turret. A rotary movement of the tool-head is also used for taking facing or cross-feed cuts. The customary cross-slide is eliminated by this arrangement, but an auxiliary cross-slide can be attached if necessary. The longitudinal turret spindle also permits the use of a long bearing of large diameter, thus insuring rigidity and accurate alignment of the tool-head.

The turret or tool-head is 15 inches in diameter, and has provision for mounting standard turret lathe tools in sixteen different positions near its circumference. Accurate indexing or positioning of the tool-head is obtained by a locking pin. Referring to Figs. 2 and 3, the bar stock to be machined is rigidly clamped in the spindle A, which is in line with the upper tool hole C in tool-

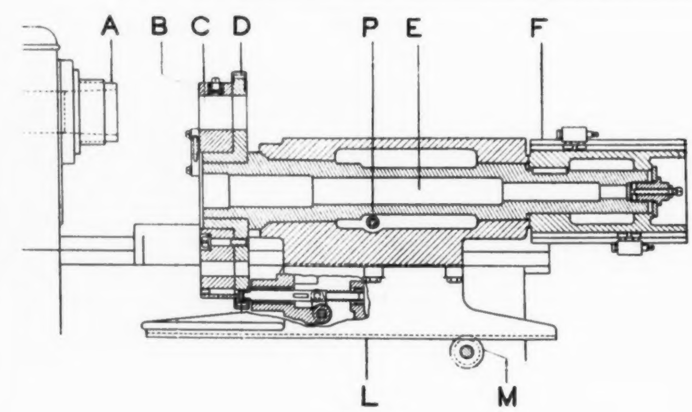


FIG. 2

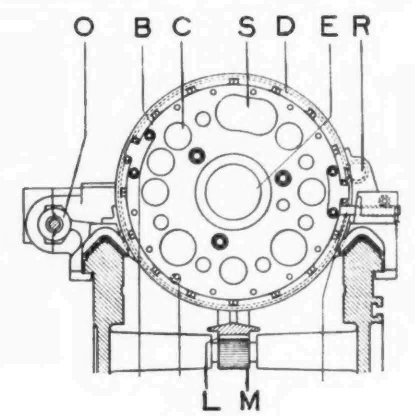


FIG. 3

Fig. 2. Longitudinal Section through Tool-head of Machine shown in Fig. 1. Fig. 3. Cross-section through Tool-head

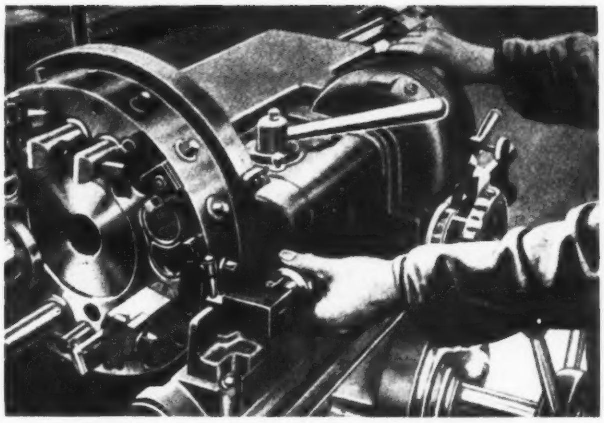


Fig. 4. Method of Employing Precision Cross-feed Stop Located Outside Tool-hole Circle

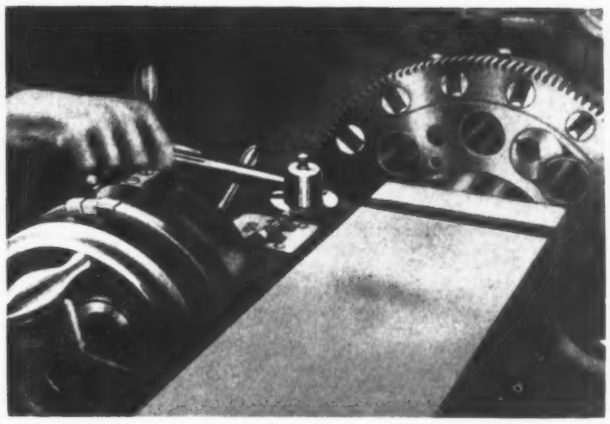


Fig. 5. Operating Locking Pin which Enters Indexing Bushings near Rim of Indexing Plate

plate *B*. Tool-plate *B* is fastened to feed-gear plate *D*, mounted on the turret spindle *E*. The longitudinal feed is effected by pinion *M* through rack *L*.

The reversible cross-feed is actuated by a pair of bevel gears at *O*, Fig. 3, and drives, through shaft *P* and a worm speed-reducing unit, pinion *R* which feeds the index gear plate *D*. An elongated hole *S* in tool-plate *B* permits bar stock up to 2 inches in diameter to pass through; thus cutting off or grooving of long pieces can be done with the tool positioned very close to the clamping collet *A* to insure smooth operation. Standard tools of box or shank type can be mounted on the tool-head, as shown in Fig. 4. The hand cross-feed stops permit work to be turned to size within 0.0005 inch.

The longitudinal and cross tool-head feeds have overload safety clutches to prevent damage to the tools or the machine. The tool-head rests on large longitudinal V-slides shown by the cross-section view, Fig. 3. These slides extend 6 inches beyond the tool-head. Additional attachments for grinding, drilling, and milling, can be mounted behind the tool-plate on the flat horizontal surface shown in Figs. 5 and 6. Long pieces can be supported by a bearing mounted behind the tool-plate on the same surface.

The detachable tool-plate *B*, Fig. 2, can be withdrawn from the head in the manner indicated in Fig. 7 and replaced with a previously set up tool-head. The changing of a previously set-up stop-drum *F*, Fig. 2, requires even less time.

Special equipment includes a thread chasing attachment; automatic chucking and feeding device; and longitudinal and transverse copying device for machining tapers.

Chucking work, as well as bar stock work, can be handled on this lathe, which has a swing over the ways of 20 inches. The maximum distance between spindle flange and tool-head is 28 3/4 inches; between automatic chucking device and tool-head, 21 inches. The spindle bore is 2 1/8 inches, giving a bar capacity of 2 inches. Stepless spindle speeds ranging from 37 to 1270 R.P.M. are available. Eight longitudinal and eight cross feeds are also available, the longitudinal feeds ranging from 0.00276 to 0.0283 inch. The cross-feeds range from 0.0025 to 0.0267 inch. The complete machine with motor weighs approximately 6000 pounds.

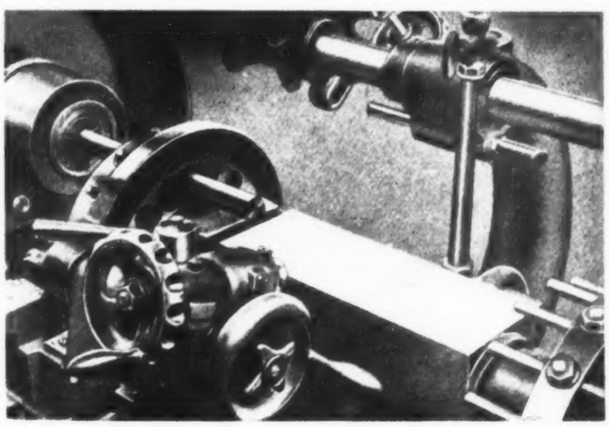


Fig. 6. Elongated Hole in Tool-head Permits Machining and Cutting off Long Pieces

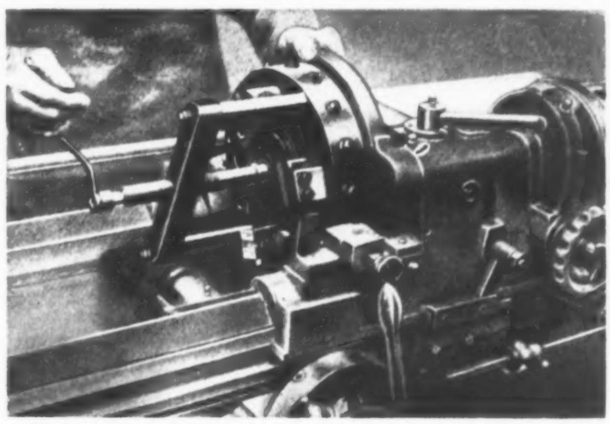


Fig. 7. Method of Using Puller when Removing Interchangeable Multiple Tool-plate

Million-Volt X-Ray Machines Aid Industry in Defense Production

MILLION-VOLT X-rays, until recently obtainable only with elaborate equipment and used in a few hospitals for cancer treatment, are now speeding America's defense efforts in four factories, a group of technical journal editors and industrialists were told during an inspection of the equipment at the plant of the General Electric Co., Schenectady, N. Y., on October 7. The Babcock & Wilcox Co., Combustion Engineering Co., Ford Motor Co., and General Electric Co. are using this high-power equipment for inspecting castings, thick welds, and numerous other heavy pieces of equipment, and additional million-volt machines will soon be in use in other plants.

The first industrial application of million-volt X-rays was made last December with one of the outfits that had been developed for medical use. It weighed 2 tons, and the equipment was enclosed in a steel tank 7 feet long and 4 feet in diameter. While in use, the equipment had to be connected to a vacuum pump in order that the X-ray tube itself would be maintained with the necessary high vacuum.

The new apparatus that is being supplied to defense plants is lighter, smaller, and simpler to use. The tank is 3 feet in diameter by 4 feet long. The unit weighs 1500 pounds. No external pumps are required, for the interior of the tube is maintained permanently at the required vacuum. Freon gas, which has been extensively used in mechanical refrigerators, is contained in the tank to provide electrical insulation. This gas, it was found, has an insulation value about three times that of oil; and in a high-voltage unit, 100 pounds of this gas will provide insulation equivalent to that of 12,000 pounds of oil.

At the plant of the General Electric Co., the new million-volt equipment is located in a special building where 200-kilovolt and 400-kilovolt X-ray equipment are also installed. The million-volt apparatus room has outside walls lined with 12 inches of brick and 14 inches of concrete. This wall protection extends 5 feet underground to

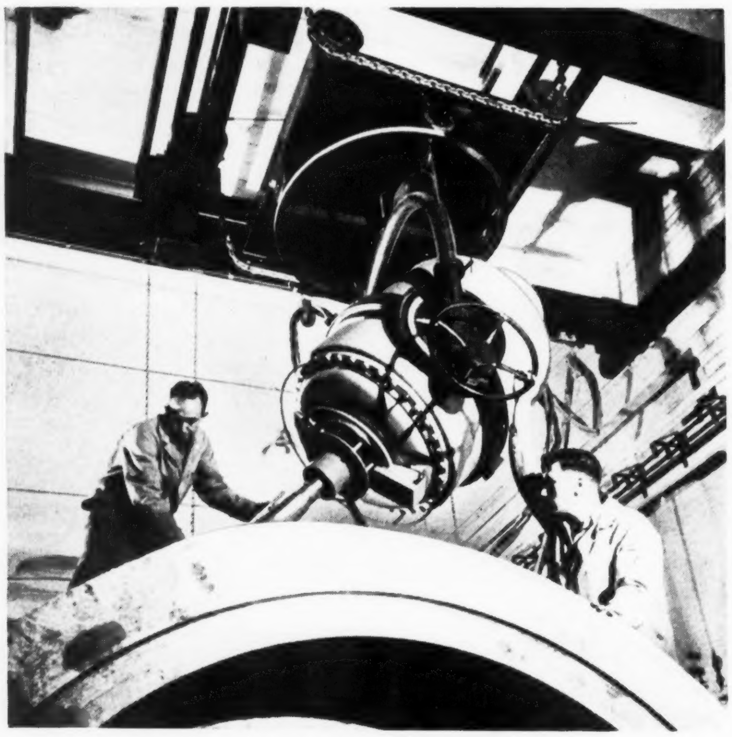


Fig. 1. A Million-volt X-ray Machine Contained in a Steel Casing, 4 Feet Long by 3 Feet in Diameter, and Suspended from Overhead, so that it can be Moved to any Part of the Test-room. This Compact Unit is Being Used to X-ray Part of a Huge Casting at the Schenectady Plant of the General Electric Co.

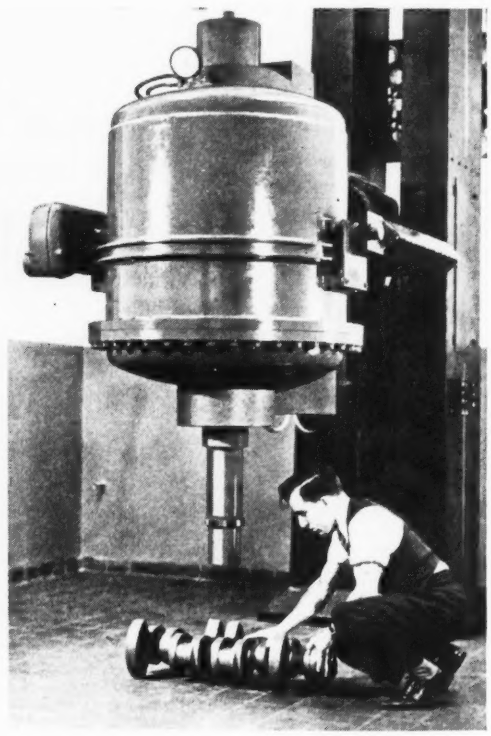


Fig. 2. Another Million-volt X-ray Machine, Mounted on a Column Type Support, Being Used to X-ray a Crankshaft in the Chemical and Metallurgical Department of the Ford Motor Co.

insure absolute safety from stray radiations. A trailer entrance is provided that admits castings weighing up to 5 tons, and a large trap door in the roof of the room permits castings up to 40 tons to be lowered from a gantry crane above the building. In spite of the intensity of the rays emitted by this powerful machine, no evidence of any stray radiation outside of the testing room has been indicated by the small X-ray films worn in wrist-bands by each of the twenty employes of the testing laboratory.

A large saving in time and labor, with greatly improved radiographs, has been obtained by the Chemical and Metallurgical Department of the Ford Motor Co. with the new million-volt equipment. In examining cast-steel crankshafts for 2000-H.P. aircraft engines, the use of the 400-kilovolt unit with the usual precautions to eliminate scattered X-rays, required six times as many man-hours as were found necessary with the million-volt equipment. Tests conducted on a heavy part for a large bombing plane required six exposures per casting with the 400,000-volt unit, while the million-volt machine can be used to X-ray six castings with a single exposure.

The new machine has great flexibility in that the amount and intensity of radiation can be controlled over a wide range. Thus, several steel castings 24 feet away can be X-rayed in a one-minute exposure at the full capacity of the machine, or the radiation can be cut down to three ten-thousandths of its capacity for a one-minute exposure where the object is only 3 inches away. By filtering the transmitted beam, the low-contrast result of radium can be duplicated, and by using the unfiltered reflected beam, a high-contrast result similar to that of lower voltage X-rays can be obtained. The potential uses and capabilities of this machine are only beginning to be realized, although it has already been in operation for nearly a year.

The equivalent of the full time of six men for four years was involved in the research work that went into the million-volt X-ray outfit, including its predecessor, a similar million-volt unit for medical work, according to Dr. W. D. Coolidge, vice-president and director of research of the General Electric Co., and consulting engineer of the General Electric X-Ray Corporation.

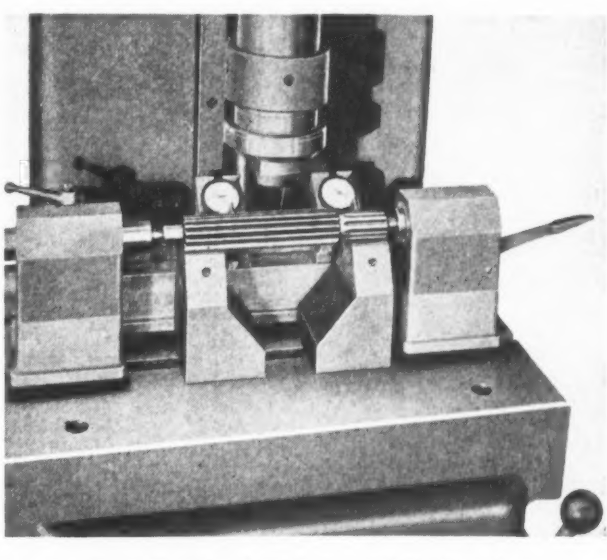
At a symposium, held prior to the inspection of the equipment, the story of million-volt X-rays, their applications and their possibilities, was told by Dr. E. E. Charlton of the G-E Research Laboratory, who described the construction of the X-ray equipment; C. D. Moriarty of the G-E Schenectady Works Laboratory, who explained the application of million-volt X-rays in the examination of large castings; O. R. Carpenter of the Babcock & Wilcox Co., and A. J. Moses of the Combustion Engineering Co., who described the application of million-volt X-rays in inspecting boiler drums and pressure vessels, and compared 1,000,000-volt and 400,000-volt use; Donald McCutcheon of Ford Motor Co., who emphasized aluminum investigations; and E. W. Page of the General Electric X-Ray Corporation, who pointed out some of the other industrial applications of X-rays. Dr. W. D. Coolidge, director of the G-E Research Laboratory, W. L. Merrill, engineer of the Schenectady Works Laboratory, and W. S. Kendrick, vice-president of the General Electric X-Ray Corporation, also appeared on the program.

* * *

Straightening Hardened Steel Shafts

To correct irregularities of a few thousandths inch in short, hardened steel shafts is a difficult task. Work of this kind, however, is being successfully accomplished on a standard 15-ton, C type "Hydroilic" press made by the Denison Engineering Co., 102 W. Chestnut St., Columbus, Ohio, equipped with special tooling.

With the ram of the press raised, the shaft to be straightened is easily fixed between centers. Gages calibrated in thousandths of an inch are moved along the shaft until they indicate a point where straightening is needed. Then the press ram, operated by the control lever, is advanced to the shaft, and the centers are lowered with the shaft to the straightening block. Additional movement of the control lever applies pressure of the tonnage required to straighten the shaft. The gages measure the shaft after the pressure has been applied, and before the shaft has been released. Very light pressure on the operating lever controls the movement of the ram, the tonnage applied being in direct proportion to the movement of the lever.



Press Equipped with Special Tooling for Straightening Hardened Steel Shafts

NEW TRADE  LITERATURE

Cleaning Compounds and Lubricants

QUAKER CHEMICAL PRODUCTS CORPORATION, Conshohocken, Pa. Technical data sheets covering the following industrial cleaning compounds and lubricants: Quaker Quasol No. 80, for removing grease, oil, and dirt from metals in washing machines; Quaker A.M. Base No. 11, a lubricant especially adapted for use in machining aluminum, zinc, and magnesium, and their alloys; Quaker Piercing Compound No. 10, for lubricating punches used in hot piercing of forged metals. 1

High-Speed Hydraulic Machinery

WATSON-STILLMAN CO., Roselle, N. J. Bulletin 110-A, describing the many ways in which self-contained high-speed hydraulic machinery and equipment can help speed production. One section of the book contains engineering tables, charts, and other useful hydraulic information. Copies available to members of engineering departments if requested on firm letterhead. 2

Metal Stampings

DAYTON ROGERS MFG. CO., Minneapolis, Minn., is distributing a pocket slide-rule that automatically gives the correct weight of any sheet or strip stock in relation to the weight of the piece to be formed; applicable to sheet steel, aluminum, copper, bronze, and other sheet alloys. Copies will be sent to those interested if the request is made on a company letterhead. 3

Tracing and Blueprint Containers

SCROLLWAY CONTAINER CO., 1440 Broadway, Oakland, Calif. Circular on the "TRIKONtainer," a special container for tracings or blueprints, designed to protect the prints when being carried or mailed, and provided with features that make it convenient to refer to them and to display them. 4

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Fill in on Form at Bottom of Page 209 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the November Number of MACHINERY

Ampco Metal

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee, Wis. Bulletins entitled "Ampco Metal in Machine Tools," "Ampco Metal in Dies," and "Ampco Metal in Aircraft," describing applications of this aluminum-bronze alloy in the fields mentioned. Catalogue describing the Ampcoloy series of bronzes, and listing a large number of industrial applications. 5

Milling and Grinding Machines

CINCINNATI MILLING MACHINE AND CINCINNATI GRINDERS, INC., Cincinnati, Ohio. Catalogue M-995, containing condensed data (arranged for ready reference) of all the current-design machines made by this company, including milling, broaching, die-sinking, grinding, and lapping machines. 6

Texrope Drives

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. Bulletin B-6051-B, describing the complete line of Texrope drives; includes a table for selecting the proper drive for different applications. Bulletin B-6190, entitled "More Power to You," descriptive of the new Texrope Super-7 V-belt. 7

Non-Ferrous Metals and Alloys

AJAX METAL CO., 46 Richmond St., Philadelphia, Pa. First issue of a publication entitled "Ajax Metelectric Progress," covering non-ferrous ingot metals and alloys, electric heat-treating furnaces, low-frequency induction melting and high-frequency melting and heating. 8

Precision Thread Grinder

LANDIS MACHINE CO., Waynesboro, Pa. Folder illustrating and describing the new Landis No. 6 precision thread grinder, designed to meet the demand for more rapid production of threads of extreme dimensional accuracy and high finish. 9

Variable-Speed Transmission

LINK-BELT CO., 2045 W. Hunting Park Ave., Philadelphia, Pa. 52-page catalogue and data book No. 1874, on the Link-Belt P.I.V. gear variable-speed transmission, by means of which any desired speed can be instantly obtained and accurately maintained. 10

Welding Equipment

AMERICAN MANGANESE STEEL DIVISION OF THE AMERICAN BRAKE SHOE & FOUNDRY CO., 389 E. 14th St., Chicago Heights, Ill. Bulletin 941-W, covering welding products for reclamation, hard-surfacing, and repairing of ferrous equipment parts. 11

Industrial Cleaning

L & R MFG. CO., 54 Clinton St., Newark, N. J. Booklet on L & R industrial cleaning machines and cleaning and rinsing solutions for the thorough cleaning of important industrial equipment, such as instruments, meters, gages, bearings, clocks, etc. 12

Slide-Rule Calculator

SUM-UP SLIDE RULE CO., 114 Liberty St., New York City. Circular descriptive of the new Sum-Up plus and minus slide-rule which enables the user to add, subtract, and convert fractions of an inch, decimals of an inch, inches and millimeters interchangeably. 13

Design and Use of Tungsten-Carbide Tools

CARBOLOY COMPANY, INC., 11147 E. 8 Mile Road, Detroit, Mich. Working manual (GT-133) on tungsten-carbide tools, covering carbide tool design, brazing, grinding, application, tool control, lubricants, etc. 14

Semi-Automatic Tapping Fixtures

R. G. HASKINS CO., 617 S. California Ave., Chicago, Ill. Bulletin illustrating and describing Haskins semi-automatic tapping fixtures, the use of which makes possible higher tapping production schedules. 15

Control Units for Welding Equipment

WELTRONIC CORPORATION, 3080 E. Outer Drive, Detroit, Mich. Bulletin S-41, on electronic controls for welding equipment and automatic machinery; includes technical material on application of welding controls. 16

Lubricants for Drawing and Forming

WAYNE CHEMICAL PRODUCTS CO., 9600 Copeland St., Detroit, Mich. Leaflet on lubricants for aluminum and its alloys—for use in drawing, forming, and pressing aluminum sheets. 17

Vibrometers

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Circular 85-910, descriptive of a pocket-size vibrometer for detecting and measuring mechanical vibration in motors, generators, and other rotating machinery. 18

Tubular Micrometers

DAVIS & THOMPSON CO., 6619 W. Mitchell St., Milwaukee, Wis. Bulletin on Davis & Thompson tubular micrometers and standards in the capacities up to 168 inches for application in the manufacture of heavy machinery. 19

Combustion Safeguard Systems

BROWN INSTRUMENT CO., Wayne and Roberts Aves., Philadelphia, Pa. Bulletin 96-3, containing information on Protectoglo combustion safeguard systems for providing protection against failure of oil, powdered coal, and gas. 20

Attachments for Rotary Shears

QUICKWORK-WHITING DIVISION, WHITING CORPORATION, Harvey, Ill. Bulletin QW-102, descriptive of special attachments for Quick-work-Whiting rotary shears to provide for cutting circles, slitting and flattening, flanging, etc. 21

Coolant Pumps

EDDINGTON METAL SPECIALTY CO., Eddington, Pa. Bulletin 936, descriptive of Edco vane type rotary pumps, suitable for lubricating and cooling in the machinery industry and also for application in the Diesel engine field. 22

Optical Measuring Instruments

PORTMAN MACHINE TOOL CO., 17 Beechwood Ave., Mount Vernon, N. Y. Circular descriptive of the Portman optical projector, an instrument for rapid inspecting, measuring, comparing, and checking. 23

Zinc Products

NEW JERSEY ZINC CO., 160 Front St., New York City, is distributing a new publication known as "Zinc in Defense," the object of which is to acquaint the reader with the myriad uses for zinc in the Defense Program. 24

Precision Gage-Blocks

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford, Conn. Catalogue on Hoke and USA precision gage-blocks, comprehensively covering their manufacture, care, and use. 25

Special Test Equipment

JOHN CHATILLON & SONS, 89 Cliff St., New York City. Catalogue 30, describing precision spring scales, dynamometers, test apparatus, and springs for industrial use. 26

To Obtain Copies of New Trade Literature

listed on pages 208-210 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail to:

MACHINERY, 148 Lafayette St., New York, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Name .... *Position or Title* ....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

Firm ....

Business Address ....

City .... *State* ....

[SEE OTHER SIDE]

Heat-Treating Furnaces

LINDBERG ENGINEERING CO., 2450 W. Hubbard St., Chicago, Ill. Bulletin entitled "Furnaces for Armament," illustrating and describing a variety of types of heat-treating furnaces. 27

Arc-Welding

HOBART BROTHERS CO., Troy, Ohio. 38-page catalogue describing the complete line of Hobart "Simplified" arc-welders and accessories with multi-range dual control. 28

Furnace Pressure Controller

BROWN INSTRUMENT CO., Wayne and Roberts Aves., Philadelphia, Pa. Bulletin 74-2, descriptive of the Brown Air-o-Line furnace pressure control and its applications. 29

Machine Tools

WALKER-TURNER CO., INC., Plainfield, N. J. General catalogue (56 pages) covering this company's standard line of metal-working and woodworking machine tools. 30

Conveyors and Industrial Washing Machines

ALVEY-FERGUSON CO., Cincinnati, Ohio. Folder entitled "How Seven Famous Companies Solved Their Product-Washing Problems." 31

Thread Grinding

NORTON CO., Worcester, Mass. Handbook on thread grinding prepared for operators of the Jones & Lamson and Ex-Cell-O thread grinding machines. 32

Nickel, Monel, and Inconel

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Bulletin T-20, giving detailed information on the annealing of nickel, Monel, and Inconel. 33

Welding Electrodes

GENERAL ELECTRIC CO., Schenectady, N. Y. Leaflet GEA-3493, containing information on cast-iron welding and an electrode developed for this purpose. 34

Precision Bearings

MINIATURE PRECISION BEARINGS, Keene, N. H. Catalogue 41, on radial, pivot, and special bearings in miniature precision sizes. 35

Industrial Lighting

GENERAL ELECTRIC CO., Schenectady, N. Y. Circular GEA-3640, describing lighting for industrial plant protection. 36

Conveyor Belts

CAMBRIDGE WIRE CLOTH CO., Cambridge, Md. Catalogue containing 140 pages on woven-wire conveyor belts. 37

Materials-Handling Equipment

ROBINS CONVEYING BELT CO., Passaic, N. J. Bulletin 113, on woven-wire screen cloth. 38

Automatic Riveters

TOMKINS-JOHNSON CO., Jackson, Mich. Bulletin RP-1, descriptive of the air-powered Rivitor. 39

* * *

Expansion of Aluminum Production

The Aluminum Co. of America has announced that under a contract made with the Defense Plant Corporation, alumina plants will be erected in the state of Arkansas with an annual capacity of 400,000,000 pounds, as well as three aluminum smelting plants, one at Massena, N. Y., one in the Portland, Oregon, district, and one in Arkansas, with a combined capacity of 340,000,000 pounds. This construction is in addition to a $200,000,000 expansion program that the company began with its own funds in 1938 and that is now nearly completed.

The production of approximately 340,000,000 pounds per year in the plants mentioned, added to the production of the Aluminum Co.'s own plants, amounting to approximately 760,000,000 pounds per year, will give the company an output of about 1,100,000,000 pounds yearly.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 211-230 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in November, 1941, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on other side of this blank.

Detach and mail to MACHINERY, 148 Lafayette St., New York, N. Y.

[SEE OTHER SIDE]

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Landis Precision Thread Grinder

The Landis Machine Co., Waynesboro, Pa., is supplementing its line of thread-cutting equipment with a machine designated the Landis No. 6 precision thread grinder. Features developed by years of experience in building thread-grinding machines for grinding various forms of threads on Landis tangential chasers for die-heads and for radial and circular chasers for collapsible taps have been incorporated in the new machine.

Flexibility of application to various work diameters, lengths, and thread pitches is an outstanding advantage claimed for this machine. Practically any desired work and wheel speeds within the full range of the machine are readily available. This permits greater accuracy of finish, as well as maximum production, and enables set-up changes to be made easily and quickly. The machine can be used advantageously for jobbing work, as well as for production thread grinding.

It is suitable for grinding both right- and left-hand external threads from 2 to 80 threads per inch up to a diameter of 6 inches. Threads 12 inches in length can be ground on work having a maximum center distance of 24 inches. Single or multiple National standard, vee, Whitworth, Acme, modified buttress, and worm threads having a maximum helix angle of 15 degrees can be ground. Studs, screws, and other parts that do not have centers can be ground by using a collet type chuck or special work-holding adapters. The flanged nose of the work-spindle is machined to conform to the American standard for lathe spindles, thus permitting standard chucks of different types to be employed without using an intermediate flange or adapter.

Simplified change-gear box construction permits grinding a large number of both English and metric pitch threads with a minimum of change-gears. The spare gear compartment is located directly below the change-gear box, while the gear chart for the various changes is attached to the inside of the gear-box cover. The work-table and the wheel-slide operate on accurately scraped surfaces on the bed of the machine, and maintain a constant length of bearing. The work-table never overhangs the end of the machine base. The table travel in either direction is controlled by adjustable trip-dogs, which are actuated through a limit switch. Slow and fast speeds in either or both directions are available.

Positive and accurate feed for the work-table is provided by a hardened and precision ground lead-screw mounted on anti-friction bearings. This lead-screw is located centrally between the ways in position to take the thrust load without binding or forcing the work-table out of alignment. The lead-screw nut of alloy bronze is rigidly mounted in the base of the work-table. It is of the solid type, has an exceptionally long bearing surface, and is always in full engagement with the lead-screw. The lead-screw has an automatic device to compensate for backlash between the change-gears.

The head for the grinding-wheel spindle is comparatively large, and is cast in one piece. The grinding-wheel spindle is made of special heat-treated alloy steel, accurately ground and mounted on four precision preloaded ball bearings. The truing device for the grinding wheel is fully automatic in its function, and is designed to provide a simple, accurate means of truing the wheel. Several different types of truing devices are available for the different thread forms, all being interchangeable on the driving unit. 51

Precision Thread Grinder Built by the Landis Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 210.

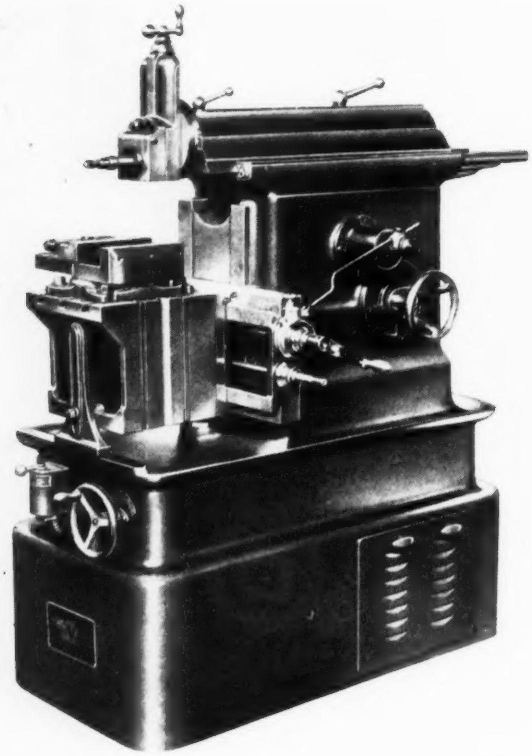


Fig. 1. Vernon Shaper for Tool-room and Production Work, Made by the Machinery Mfg. Co.

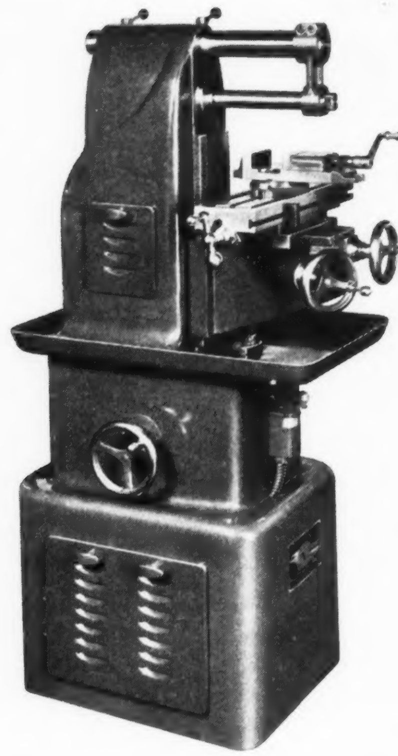


Fig. 2. Vernon No. 0 Horizontal Milling Machine Developed to Handle Small Parts

Vernon Shaper and Horizontal Milling Machine

A 12-inch shaper and a No. 0 horizontal milling machine have been added to the line of Vernon machine tools built by the Machinery Mfg. Co., 1915 E. 51st St., Vernon, Los Angeles, Calif.

The shaper, shown in Fig. 1, has been developed to meet tool-room and industrial requirements for a machine having a wide range of speed and capable of working to close tolerances. Compactness and easy operation are outstanding features.

The cross-feed is automatic in both directions, cam-actuated, and is accurately synchronized with the return stroke of the ram. Seven feeds are available, ranging from 0.0025 to 0.0175 inch. Stepless speed changes from 15 to 170 strokes per minute are obtained instantly without stopping the machine by turning a handwheel. The helical type bull gear is mounted on large Timken tapered roller bearings that are adjustable for wear. Friction type dials to provide quick adjustment are graduated to 0.001 inch.

The maximum length of stroke is 12 7/8 inches, and the ram return speed ratio 3 to 2. The table cross-feed is 11 1/2 inches, and the vertical travel is 7 1/2 inches. The table is about 10 by 12 by 10 inches.

The head is 6 1/2 inches in diameter; it has a toolpost slot 19/32 by 1 15/16 inches, and a vertical travel of 3 1/2 inches. The vise jaws are 7 inches wide and open to 5 3/4 inches. Power is furnished by a 1-H.P., 60-cycle, 1150 R.P.M. motor. The machine weighs 1060 pounds and requires a floor space of approximately 25 by 52 inches.

The No. 0 horizontal milling machine, shown in Fig. 2, is designed for the rapid and accurate milling of small parts. Its small compact design permits several machines to be installed in place of one large unit. The spindle takes a No. 9 B & S taper and has a 9/16-inch hole. The speeds range from 100 to 1000 or 150 to 1500 R.P.M.

The longitudinal feeds are 12 inches with hand-screw and 10 inches with hand-lever. The transverse feed is 5 1/2 inches. Maximum vertical distance from top of table to center of spindle is 9 1/4 inches. Longitudinal power feed can be furnished as an extra on screw-feed type machines, which provides table feeds of 0.003, 0.005, and 0.008 inch per spindle revolution. The table is 5 1/2 by 20 inches. Vise jaws have a width of 4 inches and open to 3 inches with the steel jaw and to 3 1/2 inches without the steel jaw.

A 1-H.P. motor with speed of 1750 R.P.M. is recommended for the drive. The machine has an over-all height of 60 inches and requires a floor space of 29 by 39 inches, the base dimensions being 18 by 24 inches. The approximate weight is 850 pounds. 52

Thor Portable Electric "Aircraft" Drills

The U14FS series, 1/4-inch, "Aircraft" portable electric drills brought out by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., are extremely light in weight for the power developed. These new drills are particularly adapted for use where space is very limited, or in unusually difficult positions, where power reserve and rugged construction are necessary for high-speed production. They are available in three different speeds, with side switch handles for either continuous or intermittent drilling. 53

To obtain additional information on equipment described on this page, see lower part of page 210.

Oilgear Gooseneck Presses

The Oilgear Co., 1315A W. Bruce St., Milwaukee, Wis., has brought out several new styles of gooseneck presses in capacities of from 6 to 25 tons, with controlled ram pressure, speed, and travel for fast and accurate forcing, broaching, assembling, straightening and general manufacturing. These presses are made with plain platens or low platens arranged to accommodate detachable tables or fixtures. They are also made with large openings on three sides so that they can be built into the production line for handling small, large, or long parts.

Two styles of standard controls are available, which provide sensitive control of the variable ram speed in either direction, the pressure applied to the work, and the distance the ram travel can be preset for repetitive cycles. Other special controls can be provided to meet production requirements. Two sizes of Oilgear pumps are available for each size of press, one being adapted for general manufacturing purposes, and the other for high-production work.

The 15-ton type PGRF press illustrated is equipped for straightening rifle barrels of varying lengths and diameters. A spring-balanced bar carries two overhanging brackets which support the barrel slightly above the resistance blocks. Both brackets have rollers equipped with needle bearings, and are connected by a rod for convenience in moving the barrel to the right or left. The rifle barrel being straightened is deflected against two resistance blocks, the amount of deflection being limited by a hand-operated, wedge type stop. The handwheel at the left rotates the barrel as the gages determine its straightness. 54

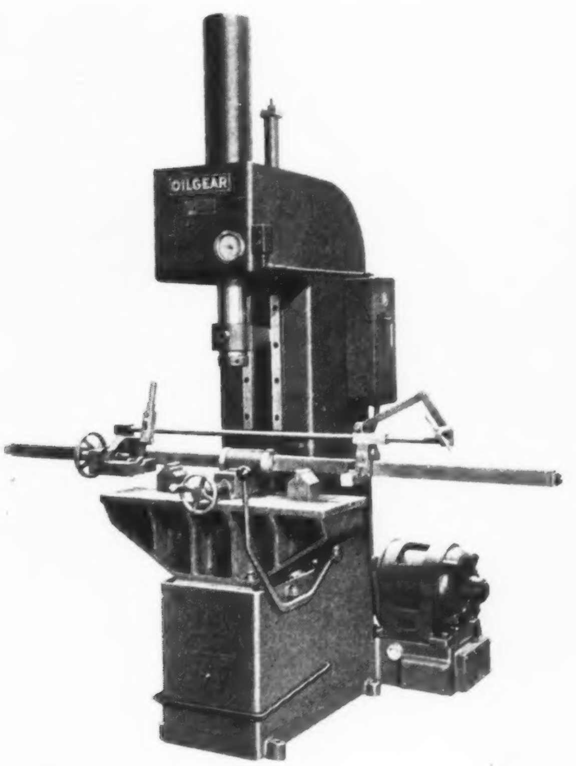
Hydraulic Press for Heading Cartridge Cases

Hydraulic heading presses with capacities of 1500 and 2000 tons have been added to the line built by the E. W. Bliss Co., 53rd St. and Second Ave., Brooklyn, N. Y., for cartridge-case heading work. The frames of the two new presses are of four-piece construction, with side housings keyed to the crown and bed, and with the tie-rods shrunk so that the press frame is preloaded.

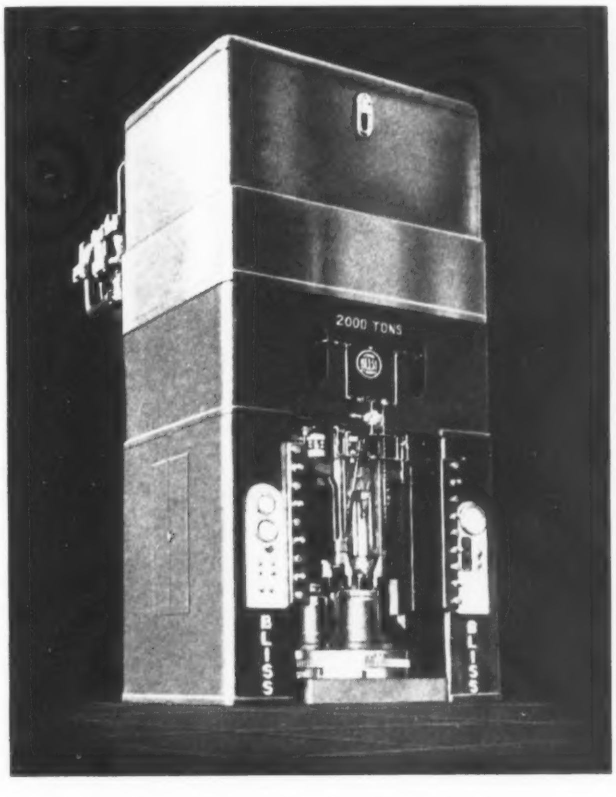
The 2000-ton press illustrated is entirely self-contained, being operated by a 75-H.P. motor on the main drive and a 7 1/2-H.P. motor on the ejector drive. The ejector, located under the loading and unloading stations, is of 38 tons capacity. The press is equipped with a two-station pneumatically operated lower work dial and with hydraulic dashpots designed to eliminate shock due to impact when stopping. The press slide is provided with a two-station punch-holder, also pneumatically operated.

The fully automatic cycle includes operation of the dial, press, punch-slide, and ejector. This automatic operating cycle can be arranged for either one or two pressings per case by operating a small selector switch. Independent pressure control is provided on each individual pressing, so that a light pressure can be exerted on a first pressing and a heavier pressure on a second pressing, or any other combination desired. With this fully automatic cycle, only one or two operators are required.

Ample time is provided for loading and also for oiling the die be-



Oilgear Gooseneck Press Equipped for Straightening Rifle Barrels



Hydraulic Press for Heading Cartridge Cases, Built by the E. W. Bliss Co.

To obtain additional information on equipment described on this page, see lower part of page 210.

tween pressings. Safety interlocks insure alignment of die and punch, and prevent operation when there is no work in the die. The automatic cycle, combined with the ejector and air hoist, makes possible a production rate of 300 anti-aircraft cartridge cases per hour, the cases being pressed twice during the automatic cycle. 55

Hydraulic Broaching Machine Equipped for Rifling 20-Millimeter Cannon

The American Broach & Machine Co., Ann Arbor, Mich., has developed a rifling machine and tools for broaching the helical rifling grooves in 20-millimeter cannon for bombers and for anti-aircraft defense. This new hydraulic rifling machine of the pull-broach type, equipped with broaches as shown in Figs. 1 and 2, will rifle the 20-millimeter bore of the 73-inch long cannon in approximately 10 minutes, floor-to-floor time. The rifling is accomplished by passing four broaches through the bore successively. Referring to Fig. 1, the small end of the cannon barrel is placed in bushing *A* of the faceplate, and the breech end is located in the quick-clamping rest *B*. The cannon to be rifled is thus centered and held in position for the broaching operation, as shown at *C*, Fig. 2.

The first broach *D*, Fig. 1, is inserted into the bore of the cannon through housing *E*, and oil-tube *F* is slid forward and locked in the position shown in Fig. 2. The cutting stroke draws the broach through the work, the spiraling bar *G* imparting to the broach the rotating movement necessary to produce rifling grooves having the required helix angle.

At the end of the broaching stroke, the first broach is removed and returned to the rack which has traveled to the right-hand end of the machine along with the broach. The return stroke carries the pull-head and the broach rack back to their starting positions. The broaching operation is then repeated, using the second broach on the rack. The third and fourth broaches are used in the same manner, the rifling being finished by the fourth broach. The fifth broach, shown at the top of the rack in Fig. 1, is a master sizing broach and is only used when the fourth broach shows signs of dullness and is to be replaced by a sharp broach. The machine is provided with variable-speed control for the cutting stroke. A stroke of 8 feet per minute, however, has been found satisfactory.

The machine is built in two sections, the right-hand section containing the hydraulic equipment, pull-head, hydraulic oil reservoir, pressure gages, spiraling bar, and electric motor, while the left-hand section contains the work-fixture, lubricating pump and motor, and the lubricating oil reservoir. This design permits the right-hand section of the machine to be used in the future, if desired,

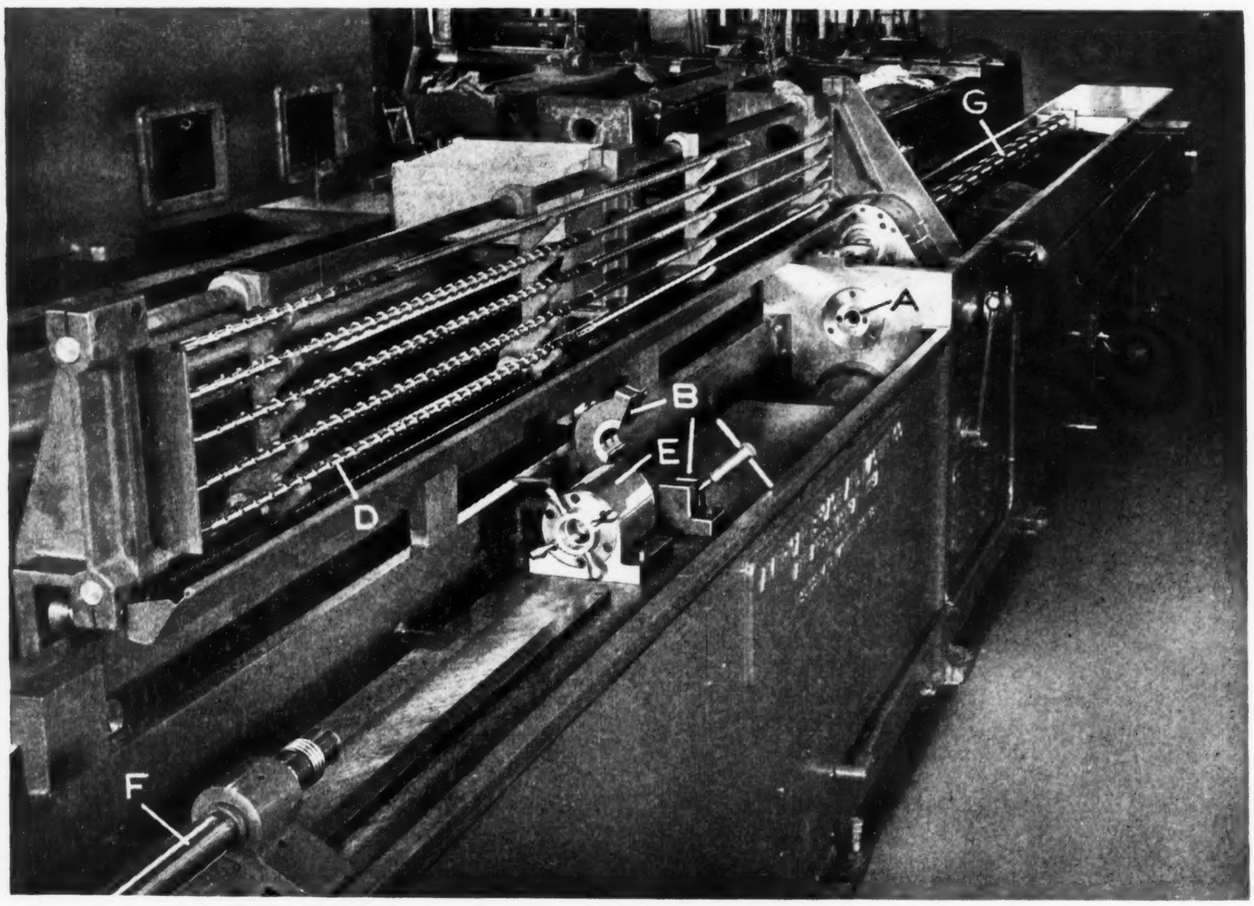


Fig. 1. Hydraulic Pull-broach Rifling Machine Developed by American Broach & Machine Co. for Rifling 20-millimeter Cannon

To obtain additional information on equipment described on this page, see lower part of page 210.

for any kind of commercial broaching work within its capacity.

The broaches are 48 inches long, have detachable shanks, and can be ground by anyone familiar with broach grinding. The teeth are designed to permit the cutting oil to force the chips ahead of the cutting edges and into the chip pockets between teeth without wedging them between the work and the tool. All broaches have a pilot at the starting end, the first broach having a plain pilot, while the succeeding ones have spline pilots for locating them in the proper position to follow the grooves previously broached.

The first broach cuts one-fourth of the width of each groove, broaching all grooves at one time and cutting to practically the full diameter minus a few ten-thousandths inch allowance for the finishing cut. The second broach removes the same amount of stock, taking a cut at each side of the groove cut by the first broach. The third broach, cutting in a similar manner, increases the width of each groove an amount equal to one-fourth the full width. The fourth broach follows the same procedure, with the exception that several teeth at the finishing end cut the grooves to their final width and full depth. 56

Improved Colonial "Junior" Presses

The Colonial Broach Co., 147 Jos. Campau St., Detroit, Mich., has made a number of changes in the design of the "Junior" presses which were described and illustrated in June, 1939, MACHINERY, page 722. The work-handling capacities have been so increased that the number of presses in this line has been reduced to two. These presses are designed for such operations as assembling, straightening, etc., and are now made in hydraulically operated units rated at 1/2- and 1-ton capacities, both with 12-inch stroke.

Revisions in previously specified dimensions of these standardized presses include an increase in platen depth from 8 to 9 1/2 inches, with an increase in the throat from 5 to 5 1/2 inches, and an increase in the base dimensions from 14 by 22 to 17 by 24 1/2 inches. While designed primarily for work on small parts, the large amount of throat clearance between the ram and the column permits operations on large bulky parts. The platen is 14 inches wide, and has a slot 2 1/2 inches wide in it. The presses weigh 300 and 350 pounds. The over-all height has been increased to 37 inches for both sizes. These presses can also be employed for light broaching operations.

Control of the ram stroke is through a four-way valve, operated manually by a single-lever control. The downward speed of the ram is 30 feet per minute, and the upward or return speed 60 feet per minute. The self-contained operating system in both models includes constant-delivery pumps submerged in an oil reservoir in the base. A 1-H.P. motor is used for the 1/2-ton press, and a 1 1/2-H.P. motor for the 1-ton press. 57

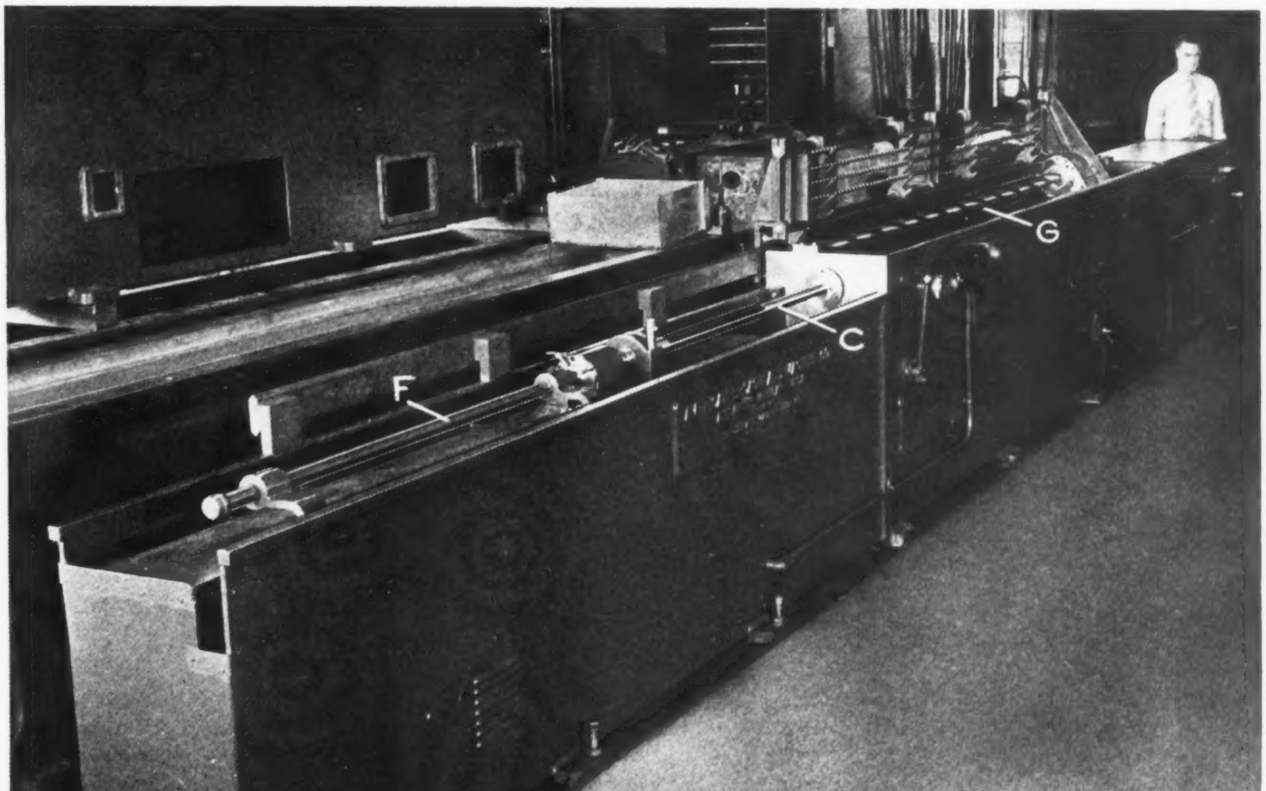


Fig. 2. Broaching Machine with Cannon C in Place and Broach at End of Cutting Stroke Ready to be Removed and Placed in Rack for Return to Starting Position

To obtain additional information on equipment described on this page, see lower part of page 210.

Portman All-Purpose Milling Machine

A new type milling machine embodying several unique features is being placed on the market by the Portman Machine Tool Co., 17-19 Beechwood Ave., Mount Vernon, N. Y. This all-purpose machine, with vertical mounting of the carriage table made possible by the specially designed saddle, permits mounting unusually large work or bulky fixtures under the spindle. The pivot mounting of the table-elevating screw housing also permits large work which may extend down to the base of the machine to be clamped directly to the front of the carriage table.

The ram type spindle-housing member is movable across the face of the table, enabling the operator to set the machine to the work, thus eliminating the necessity for making an entirely new work set-up for many operations. Various supplementary units are available which provide for practically all types of milling, either in toolroom or production work. These units consist of two types of vertical spindle mountings for both high- and low-speed operation. A trunnion-mounted universal type table, designed to pivot 180 degrees and adjustable to a maximum of 45 degrees from the horizontal to provide for compound angle work, is available. A slotted head and a rotary table can also be furnished. All these units can be used independently or in conjunction with each other.

The standard machine is furnished with an adjustable arbor-support head and a removable right-angle work-table. Eight spindle speeds ranging from 90 to 1760 R.P.M. are provided. The table feeds are independent of the spindle speed and provide a range of feed from 3/4 inch to 14 1/2 inches per minute. The working surface of the vertical table is 32 by 10 1/2 inches. The distance from the spindle nose to the base of the machine is 46 inches. The machine can be equipped with a complete coolant system consisting of a motor-driven coolant pump and reservoir with splash guards. The machine is driven by a 2-H.P. built-in motor. 58

Shields Vertical Milling Machine Equipped with Universal Head

A new type vertical milling machine with universal head, brought out by the Shields Mfg. Co., Inc., 38-09 Twenty-Fourth St., Long Island City, N. Y., has the motor and gearing built as an integral unit with the spindle assembly. A 1200-R.P.M., 1 1/2-H.P. motor, operated by start and stop and left- or right-hand switch on the head, drives the spindle either directly through a four-step cone or through helical back-gears at speeds of from 72 to 1630 R.P.M. The eight available speeds obtained by means of this drive are arranged in geometrical progression.

The spindle is supported by precision ball bearings at the nose, a ball bearing in the middle, and another at its end. It has a standard No. 40 taper. The pulley on the spindle is supported by two ball bearings, and drives the spindle through a positive clutch or the back-gears. Both the clutch and back-gears run in oil. End-mills 1/8 to 3/4 inch in size can be used when the spindle is driven by belt, and face milling cutters up to 6

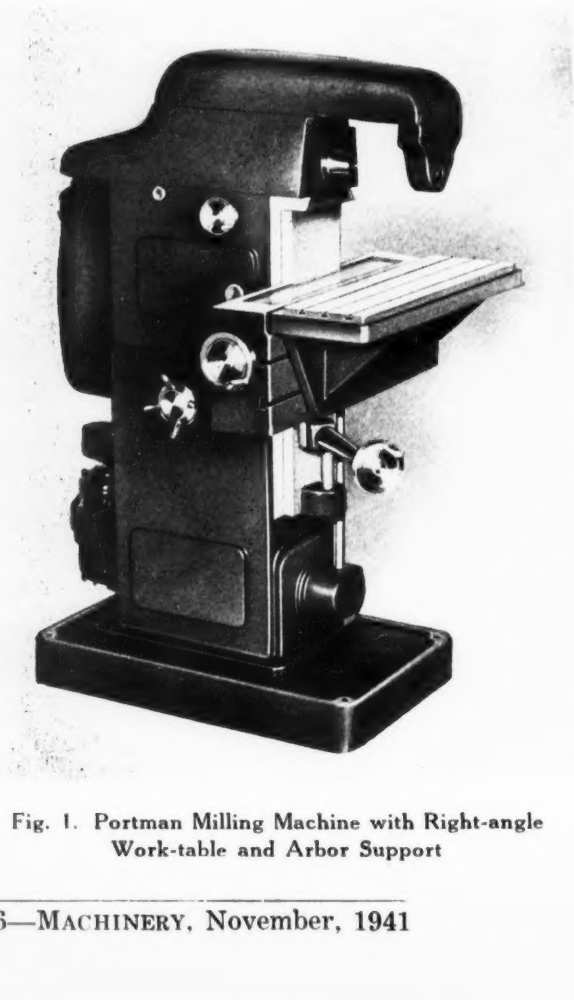


Fig. 1. Portman Milling Machine with Right-angle Work-table and Arbor Support

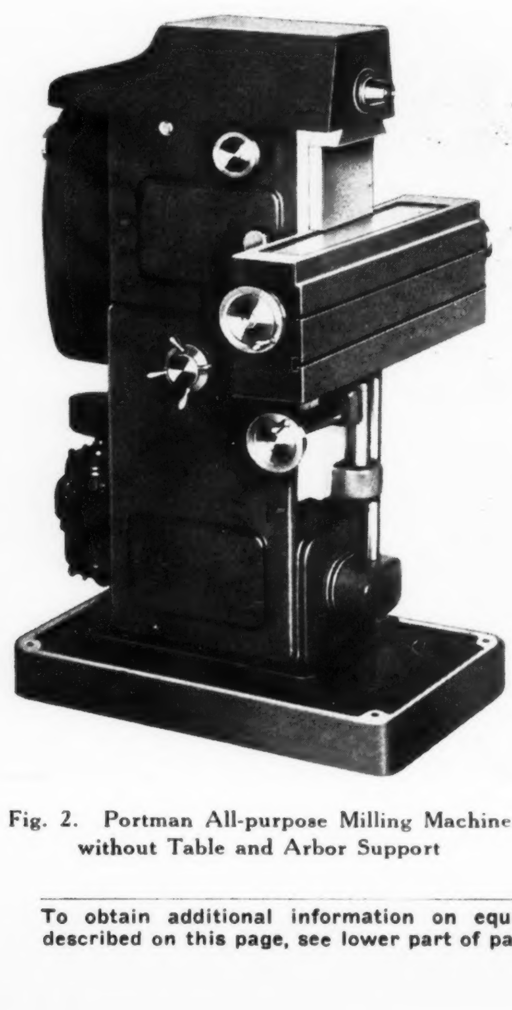


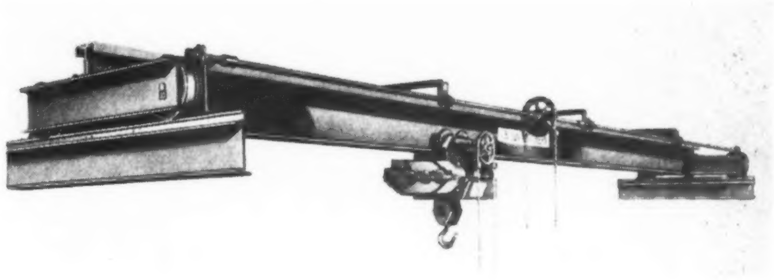
Fig. 2. Portman All-purpose Milling Machine without Table and Arbor Support

To obtain additional information on equipment described on this page, see lower part of page 210.

inches in diameter can be easily driven through the use of the back-gears.

The spindle slide can be moved 5 inches by means of a handwheel acting through a worm which can be disengaged to permit fast operation by a lever. A four-position stop on the slide can be used for step-milling or boring. The head can be turned 33 degrees forward or backward with respect to the column by a crank which operates through a worm-wheel and can be locked by a single nut. The head can be swiveled 360 degrees on the column by means of a crank operating through a worm.

The working surface of the table is 12 by 56 inches; the table has a vertical travel of 14 inches, a cross travel of 12 inches, and a longitudinal feed of 30 inches. Feeds and power rapid traverse are provided for the table only. A small handwheel on the saddle governs the rate of feed, which is indicated by a dial in back of the handwheel. A 1/2-H.P. motor mounted in the saddle drives two variable-speed pulleys. The feed-gears run in a bath of oil. A 1/4-H.P. coolant pump is mounted in the base. The spindle slide, table saddle, and knee can be locked in position. 59



Electric Hoist Crane Brought out by Northern Engineering Works

Northern Electric Hoist Crane

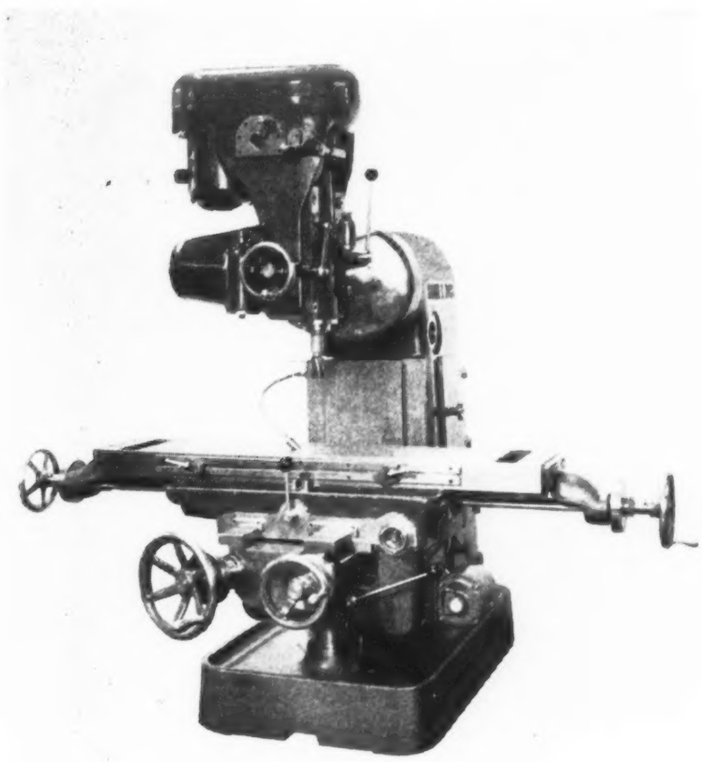
The Northern Engineering Works, Detroit, Mich., has brought out a line of electric hoist cranes for auxiliary use in large plants and for main hoisting in smaller plants. These cranes are designed for economical operation and easy handling. They are built in various capacities up to sizes large enough to move 15-ton loads.

Among the many different types available are the top-running or under-hung designs, hand or motor travel bridges and hoists, transfer types, special double-hook types, and auxiliary jib and self-supporting pillar cranes. Cab control is furnished where desired.

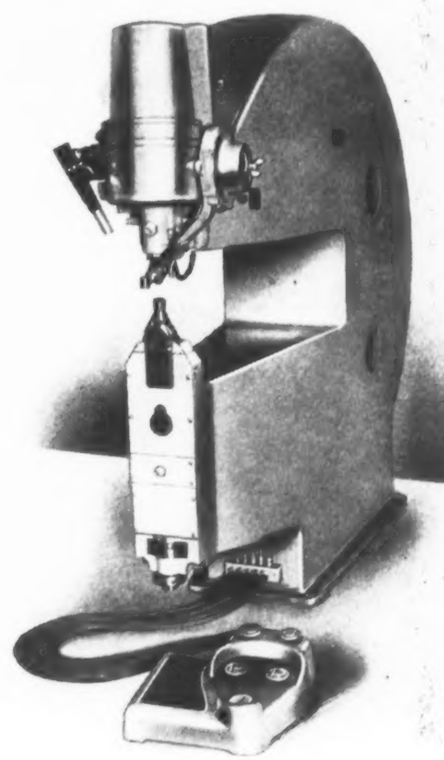
All of these cranes are furnished with the Northern Hi-Lift hoist, which is a low head-room hoist designed to give maximum hook lift, insure continuous operation, and provide positive control. 60

Erco Automatic Punching and Riveting Machine

A Model No. 1002 C-frame riveter with a 48-inch throat has been brought out by the Engineering & Research Corporation, Riverdale, Md. Air-operated remote control and quick-drop anvil support operated by the same control unit are regular equipment on this machine.



Vertical Milling Machine Placed on the Market by the Shields Mfg. Co.

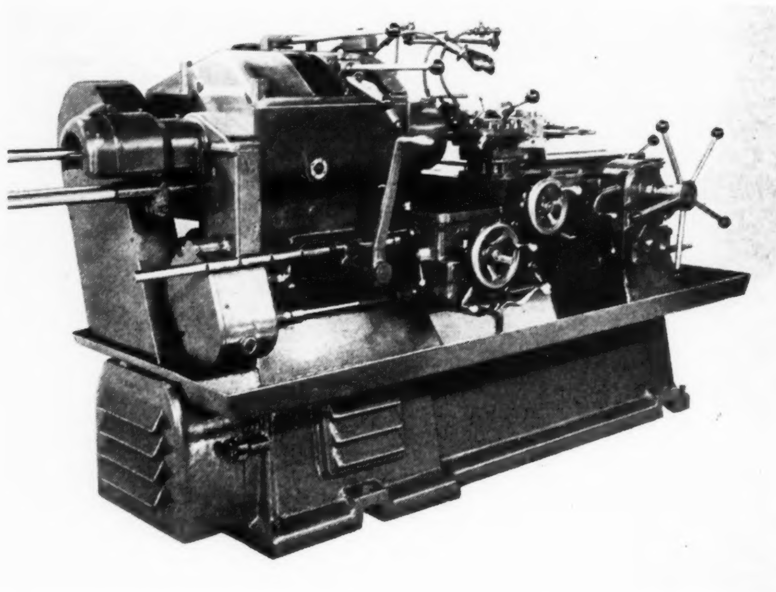


Erco Automatic Punching and Riveting Machine with Remote Control

To obtain additional information on equipment described on this page, see lower part of page 210.

The remote control can be placed in the most convenient position for riveting large sections.

The quick-drop anvil support provides a 4 1/2-inch opening in the punching and riveting head for feeding and removing deep channel sections. A special spotlight indicates the point where the hole is to be punched. This riveter will automatically punch and countersink holes and feed and head rivets up to 3/16 inch in diameter in one continuous operation by depressing two foot-operated buttons without shifting the material. 61



Merritt-Millholland Turret Lathe Designed for High-speed Operation

Merritt-Millholland Turret Lathe

A turret lathe designed to provide the power, strength, and stability required to handle the newer cutting tools at high speeds is being placed on the market by the Merritt Engineering & Sales Co., Inc., Lockport, N. Y. The Nos. 4 and 5 machines are built with a full cabinet base. The sub-base, of new patented design, has been developed to insure rigidity and provide for mounting the motor under the headstock.

A number of outstanding features are incorporated in this machine, such as 11-inch spacing of the ways, employed to give extra crosswise rigidity and stability to withstand torque stresses produced by the cutting action. The hardened V-ways are made with soft steel cores. An important feature from the standpoint of convenience is the arrangement of the cross-feed knock-out stops, by means of which instant choice of four positions, involving both forward and reverse feeds, is obtained by simply turning a knob. The headstock has twelve speeds forward and reverse, ranging from 35 to 715 R.P.M., with automatic spindle brake and multiple-disk clutch.....62

Refrigerating Units for Aluminum and Stainless Steel Welders

A line of refrigerating units designed to increase the production capacity of welding machines used in the resistance welding of aluminum and stainless steel has been brought out by the Progressive Welder Co., Detroit, Mich. Although these refrigerating units, for which patent applications have been made, are intended for use on machines made by the Progressive Welder Co., they are also being made available for welding machines manufactured by other companies for defense work, such as aircraft assembling, etc.

It is claimed that this unit makes possible the continuous welding of four to ten times as many spots in aluminum as previously without requiring dressing of the welding point. When used in combination with a spot-welding machine, the unit shown in Fig. 2 reduces the electrode temperature to a point where, in spite of the high heat necessary to produce a weld, the electrodes will be continuously covered with frost, as indicated in Fig. 1.

The units are available in a range of three sizes designed for use with (1) a nickel-aluminum welder; (2) two welders; and (3) a bank of four

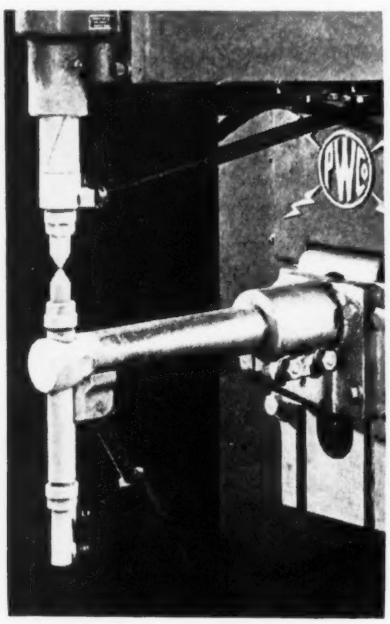


Fig. 1. Welder Using Refrigerating Unit which Keeps Electrodes at Sub-freezing Temperatures

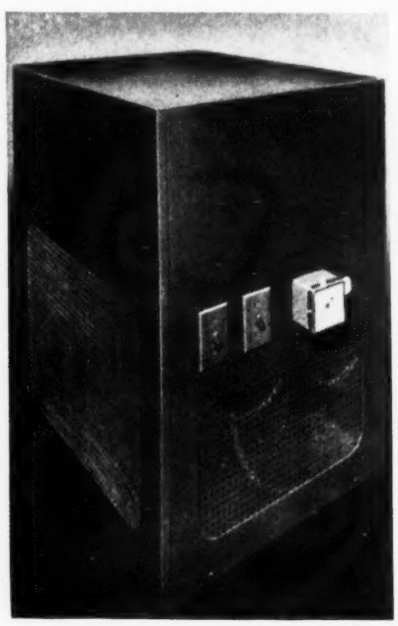


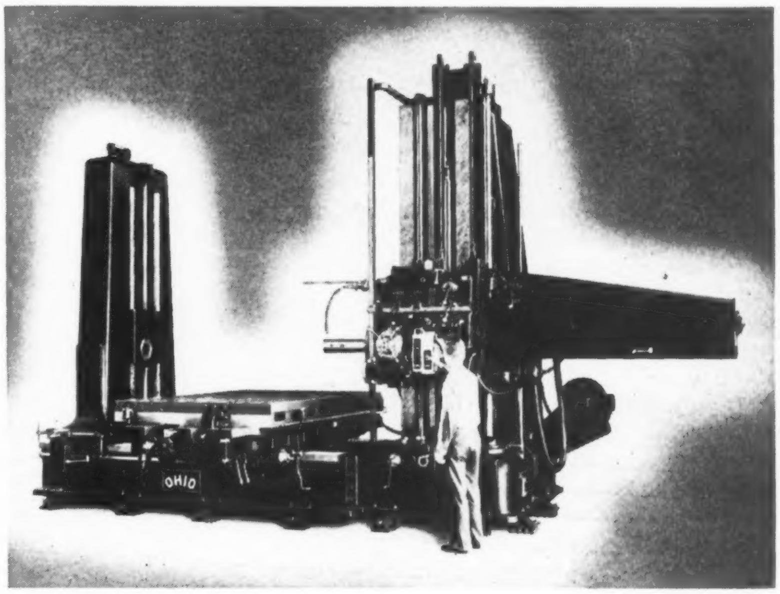
Fig. 2. Refrigerating Unit Made by Progressive Welder Co., for Aluminum and Stainless Steel Welding

To obtain additional information on equipment described on this page, see lower part of page 210.

welding machines. The units are provided with automatic thermostatic control, all standard safety appliances, built-in dehydrator, heat exchanger, external indicating thermometer, high efficiency pump with variable pressure, etc. Installation of the refrigerating unit is easily accomplished. 63

Moline Milling Machine for Aircraft Engine Work

A single-purpose machine designed for aircraft engine work has been brought out by the Moline Tool Co., Moline, Ill. This machine is equipped to mill spherical clearances in the ends of the bolt-holes used in tying together the crankcase sections of radial type aircraft engines. The crankcase section to be machined is clamped on the round indexing table. The machining cycle is started by means of a push-button, and the holes are milled, two at a time, with automatic indexing from one pair of holes to the next until the work is complete and the machining cycle stopped. Electrical and mechanical interlocking prevent the cutters from entering the work at any point except directly over the centers of the holes to be milled. 64



"Dreadnaught" Horizontal Boring, Drilling, and Milling Machine

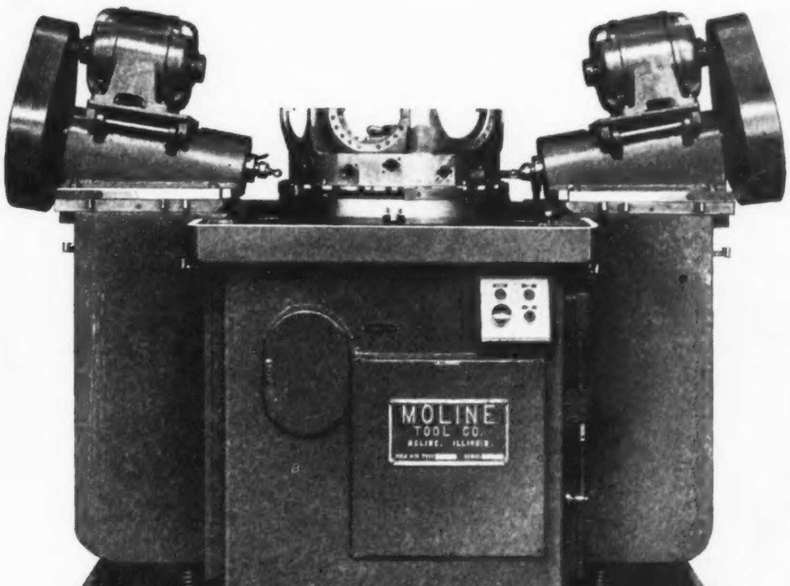
"Dreadnaught" Boring Mill

The Ohio Machine Tool Co., Kenton, Ohio, is now building a "Dreadnaught" horizontal boring, drilling, and milling machine of larger size than any previously manufactured by this company. The table of this new machine is 72 by 132 inches; the bed is 60 inches wide; and the distance between the faceplate and the bar support ranges from 10 to 20 feet. The vertical travel of the spindle head is 96 inches, and the continuous spindle feed 72 inches.

This machine has anti-friction bearings throughout; automatic lubrication; built-in electrical power rapid traverse with push-button control; narrow guide construction for all moving units; push-button control for start-stop, forward-reverse, and run-jog of the spindle; pressure lubrication to all sliding surfaces; unit construction, providing accessibility to all units; multiple-splined shafts with splines milled from the solid for all sliding gears and clutches; and mechanical clutches.

The box-shaped, counterbalanced spindle head carries the speed and feed transmission, the loads from spindle and gearing being transferred to the column face. All feed and speed changes are grouped, so that the operator need not move from his normal position. The multiple-disk, magnetic type driving clutch gives complete spindle control through a portable push-button unit. The ratio between low and high speed is 1 to 190, with a maximum speed of 600 R.P.M.

Chromium-nickel alloy-steel feed and spindle speed gears, heat-treated and hardened; high tensile strength alloy-steel cast spindle driving sleeve with Nitralloy bushings; Nitralloy forged spindle, heat-treated and hardened; and heat-treated and ground shafting are examples of materials used



Moline Single-purpose Milling Machine for Aircraft Engine Work

To obtain additional information on equipment described on this page, see lower part of page 210.

in this machine. The machine is also available in a floor type with corresponding characteristics to meet the user's specifications. 65

Delta Drill Press

An improved type power-feed drill press in the low-priced field has just been placed on the market by the Delta Mfg. Co., 605M E. Vienna Ave., Milwaukee, Wis. The unusual design of the power feed unit, which operates directly from the bottom drive of the motor instead of from the spindle, makes possible a wide range of feeds from 0.001 to 0.016 inch per revolution of the spindle in the slow-speed type, and from 0.0005 to 0.009 inch in the high-speed type.

Two four-step cone pulleys and a special belt tension release permit feed changes to be made quickly and safely. The bronze power feed-gear and the hardened and ground steel worm are designed to insure positive and accurate stopping, combined with long service. Other features include quick traverse by hand from starting position to work, instant switching from power to hand feed and reverse without changing or removing parts, safety lock for preventing damage to drill press when power feed is disengaged, and adjustable automatic stop.

This new line includes single- and multiple-spindle 17-inch units in slow- and high-speed models, with table- or head-raising mechanisms, driven by either Delta or standard NEMA frame motors. 66

Gage for Checking Anti-Aircraft Shells

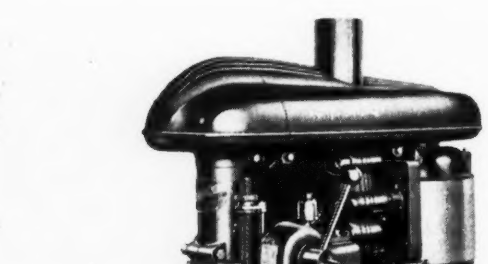
A Model 100B-15 shell gage for checking 37-millimeter anti-aircraft shells has been brought out by the Federal Products Corporation, 1144 Eddy St., Providence, R. I. This gage comprises a regular Federal comparator equipped with five indicators mounted on an adjustable bracket for use in checking the diameter and concentricity of the shell simultaneously at specified points, including concentricity of the fuse hole. The shell is cradled on roller V-blocks, as shown in the illustration.

With this gage, the inspector can determine whether the shell dimensions meet requirements, and if not, how much they vary from the specified dimensions. This enables over-size shells to be saved by refinishing. The roller V-blocks on which the shell rests can be rotated to compensate for wear. The shell is located laterally by an adjustable stop-screw. This gage can be made for shells of various sizes. 67

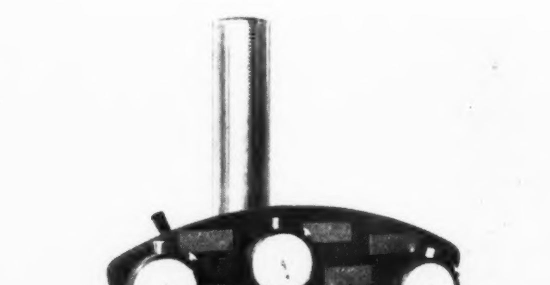
Globe Coil-winder Equipped with Counter

Globe Universal Coil-Winder with Counter

A high-speed 10,000-turn counter has been brought out by the Globe Tool & Engineering Co., 438 Davis Ave., Dayton, Ohio, for the No. 2 universal coil-winder made by this company. The counter permits the winding machine to be operated at the maximum speed at which wire can be fed on the winding fixture. By using a simple fiber guiding block, the operator can accurately level the wire on the winding spindle at speeds up to



Drill Press Brought out by the Delta Mfg. Co.



Federal Gage for Checking 37-millimeter Shells

To obtain additional information on equipment described on this page, see lower part of page 210.

4000 R.P.M. If it is desired to remove turns from a coil, as in the case of an over-run, the required subtraction is made by the counter. After a coil is wound, the counter is quickly reset to zero preparatory to winding the next coil.

Full control of the coil-winder through the foot-pedal of the quick-acting brake, mercury starting and stopping switch, and motor speed control are all synchronized for rapid, smooth acceleration and immediate deceleration. The model designed for winding No. 25 to No. 40 copper wire or its equivalent has a speed range of from 0 to 6000 R.P.M., while back-geared models are available with ratios for the higher torque required in winding larger wire. 68

Automatic Metallizing Machine for Coating Aircraft Engine Cylinders

A new automatic metal-spraying machine designed to eliminate hand-spraying operations on aircraft engine cylinders has been developed by the U. S. Galvanizing & Plating Equipment Corporation, Brooklyn, N. Y., in collaboration with the Metallizing Engineering Co., Inc., 21-07 Forty-first Ave., Long Island City, N. Y.

The machine comprises six individual stations, each controlled by reducing gears and fully adjustable to various motions and speeds. The cylinders are loaded at one station and then indexed to four succeeding stations, where metal coatings are automatically applied to different sections of the cylinder assembly. The final step in the cycle, at the sixth station, consists of inspecting and unloading the work. The machine is equipped with "Metco" controlled power metallizing guns and accessories.

These machines have been installed in the plants of some of the largest manufacturers of air-cooled aircraft engines for use in spraying aluminum and similar corrosion-resistant metals on air-cooled cylinders. A single machine is capable of spraying from thirty to forty complete cylinder assemblies per hour. 69

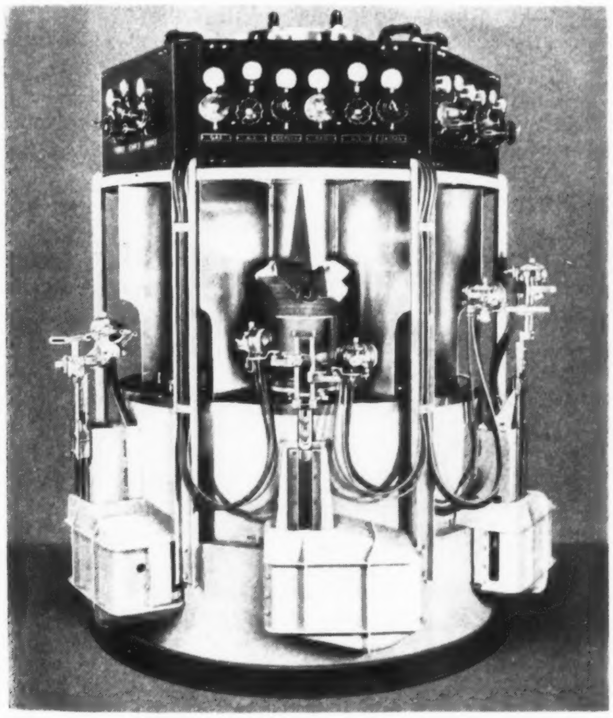
Cleveland Straight-Sided Double-Crank Press

A straight-sided, double-crank press of four-piece tie-rod construction, single-geared, equipped with an electrically controlled hydraulically operated friction clutch and brake, is being built by the Cleveland Punch & Shear Works Co., Cleveland, Ohio. This press is arranged with an automatic, hydraulically operated single roll feed for feeding material 13/32 inch thick by 2 1/2 inches wide, from right to left across the dies.

The press is set at a permanent incline of 30 degrees to permit the finished pieces to fall into tote boxes at the rear, and is designed with a box type crown so that there are no overhanging gears or other projecting members. All gears run in a bath of oil, and the slide, which can be spring- or air-counterbalanced, is arranged for hand adjustment. The slide has a 3-inch stroke, a 3 1/2-inch adjustment, and operates at the rate of 45 strokes per minute. The bed is 30 by 84 inches. The capacity of the press is 150 tons. 70

Oakite Steam Gun for Cleaning Operations in Shops and Shipyards

An improved type of steam gun designed to speed up the many cleaning operations required in building naval vessels, oil tankers, and merchant ships, as well as for use in removing grease, oil, chips, and dirt from large machine parts between operations or before inspection and assembly, has been developed by Oakite Products, Inc.,



Automatic Metallizing Machine for Coating Cylinders

Cleveland Press with Electrically Controlled Clutch

To obtain additional information on equipment described on this page, see lower part of page 210.

26 Thames St., New York City. This solution-lifting gun provides the triple combination of heat, mechanical force, and effective detergent action required to perform many difficult cleaning operations quickly and thoroughly.

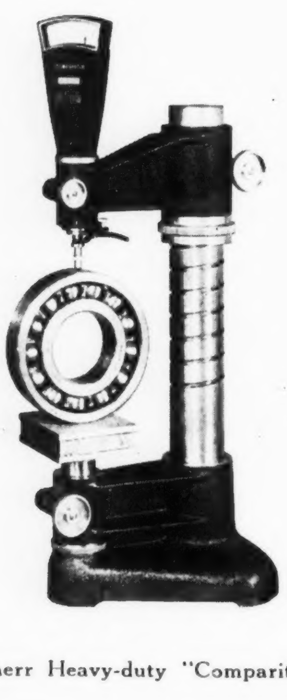
New features enable this gun to automatically lift the cleaning solution from the floor level to a working height of 12 feet without the aid of pumps, injectors, or other accessories required in steam cleaning. All that is needed to operate the gun is a steam supply line at a pressure of 30 pounds per square inch or more, hose lines for the steam and solution, and an open-top container for the cleaning solution. 71

Scherr Heavy-Duty "Comparitol"

The George Scherr Co., 128 Lafayette St., New York City, has just brought out a heavy-duty Model 8 "Comparitol" capable of measuring precision work up to 8 inches in diameter. This inspection instrument has a simple, patented, knife-edge, lever-system mechanism, and is designed to eliminate the human element of "feel" and skill in making close measurements.

The instrument has a column 2 1/2 inches in diameter, a heavy bracket which holds the measuring head, and a 4- by 4-inch, hardened-steel, accurately lapped table. The rigid base has three-point contact. This type of instrument is being used to check and inspect plug gages, bearings, pins, ball bearings, and other parts. It can be obtained with a scale reading to 0.0001 or to 0.00005 inch.

The instrument is not affected by vibration, and can be used under abnormal shop conditions where shock of machinery or instability of floors would seriously interfere with the use of regular inspection instruments. 72



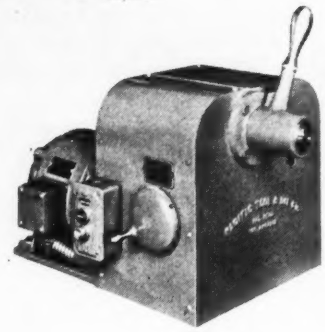
Scherr Heavy-duty "Comparitol"

"Maxitorq" Single Type Clutch

"Maxitorq" Multi-Disk Floating-Plate Clutches

The Carlyle Johnson Machine Co., 52 Main St., Manchester, Conn., is manufacturing "Maxitorq" multi-disk floating-plate clutches in wet- or dry-plate type, and either single or double construction, which are particularly adapted for installation in machine tools and for use in all industrial machinery requiring clutches ranging in capacity from 1/2 H.P. at 100 R.P.M. up to 5 H.P. at 100 R.P.M. The maximum working torque range covered by this line of clutches is from 27 to 263 foot-pounds.

The floating plates are designed to provide for a minimum of drag, abrasion, or heating when the machine is running in neutral. Assembly or disassembly can be accomplished without the use of tools. Manual adjustment is obtained by turning a knurled ring clockwise after raising the locking spring. Engagement of the clutch is easily controlled by a light pressure. All plates of the wet type are of hardened steel, designed to run in lubricant. Steel plates and self-lubricating bronze plates are assembled alternately in the dry-plate type clutch. 73



"Vera-Lathe" for Polishing, Lapping, and Buffing Work

Pacific "Vera-Lathe" for Polishing, Lapping, and Buffing

An improved second-operation machine known as the "Vera-Lathe," which provides an infinite number of spindle speeds ranging from 5000 down to 1250 R.P.M., has been introduced on the market by the Pacific Tool & Die Co., 1225 E. 63rd St., Los Angeles, Calif. This machine has been especially designed for polishing, buffing, filing, burring, sizing, finishing, and lapping round parts, and embodies several new features.

The collet-operating mechanism at the front end of the spindle is designed to save time by permitting the spindle to rotate while the work is being inserted. This arrangement eliminates wear on the machine through frequent stopping and starting. This collet can be arranged for foot operation if desired. Interchangeable spindles can be furnished to accommodate special chucks or fixtures.

The ball-bearing spindle is equipped with a hollow draw-tube that has a 13/16-inch bore and is adapted for holding collets having a maximum capacity of 3/4 inch. The tension of the collet can be easily adjusted by simply turning a handwheel. This handwheel also facilitates changing collets.

Various spindle speeds are quickly obtained by turning a handwheel on the side of the lathe. The high speeds required for lapping, polishing, and buffing, and the lower speeds necessary for burring and filing, can be quickly obtained. The machine is operated by a 1/2-H.P. electric motor, either single- or three-phase, and is completely wired, including starting switch, ready for operation. 74

To obtain additional information on equipment described on this page, see lower part of page 210.

Jefferson Swing-frame Polishing and Grinding Machine

Jefferson Swing-Frame Grinding and Polishing Machine

An improved universal grinding and polishing machine with a frame that can be swung forward and backward, up and down, right and left, and to any angle at the spindle head, has been brought out by the Jefferson Machine Tool Co., Fourth, Cutter, and Sweeney Sts., Cincinnati, Ohio. This machine, known as the No. 101 swing-lathe, is designed for use in foundries, plating plants, and all shops where grinding, polishing, and buffing on large pieces are necessary.

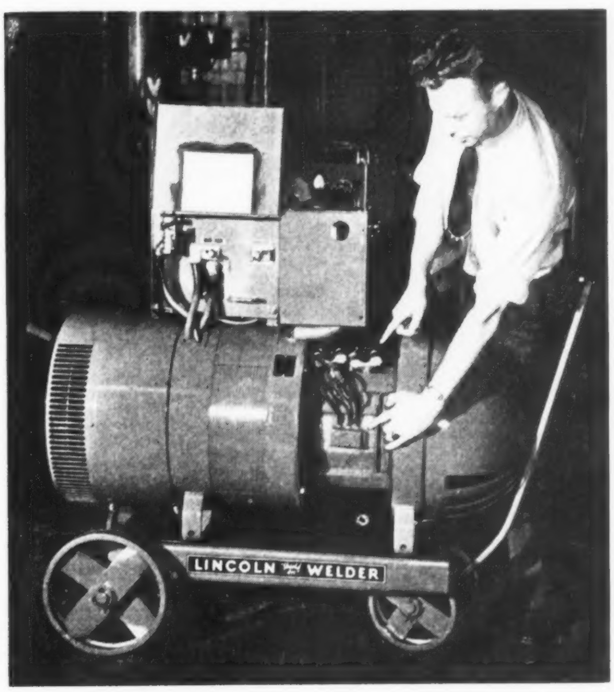
It can be easily bolted to the ceiling, and is adapted for grinding and cleaning rough castings of any kind, shape, or size. It is especially recommended for use in cleaning castings preparatory to enameling and finishing, and for grinding or polishing sheets, tubing, bars, shapes, etc., that are too large to be handled on ordinary floor lathes.

The motor and the counterbalancing cable and weights are arranged to permit handling the machine with little effort. Emery or Carborundum grinding wheels up to 14 by 2 3/4 inches, and polishing and buffing wheels 14 by 3 inches, can be used. Attachments, such as flexible metal tube exhaust pipe, can be furnished. A ball-bearing, fully enclosed, 3-H.P. motor for 220-volt, three-phase current, operating at 1750 R.P.M., drives the machine through V-belts. The machine, complete with motor, weighs 610 pounds. 75

Lincoln Protective Control for Welding Sets

Complete protection of arc-welding machines against excessive heat or current overload is provided by a new protective control device recently developed by the Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio. This device is designed to facilitate the continuous operation of arc-welding generators at maximum current capacity. Two snap-action thermostats connected to two transformers in series with the motor leads prevent overheating.

The thermostats automatically reset when the motor temperature falls to a safe point or when the excessive current is reduced, and the only manual operation required to put the machine back into service is the pushing of the starter button. When the trouble has been rectified, a special circuit allows the starter button to be held "in" and the machine to be rotated with no load, although the thermostats are still "tripped," so that the welder ventilation will speed the cooling of the machine down to a safe operating temperature. 76



Protective Control Mounted on "Shield-Arc" Welder

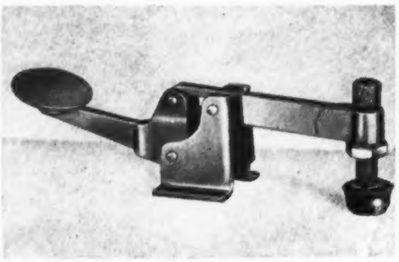
Carbide Tool Grinder Brought out by Hammond Machinery Builders

Hammond Carbide Tool Grinder

A 10-inch carbide tool grinder combining facilities for straight-wheel, peripheral, and cup-wheel face grinding has been added to the line of carbide tool grinders manufactured by Hammond Machinery Builders, Inc., 1619 Douglas Ave., Kalamazoo, Mich. The work-tables on this grinder can be tilted from the zero or level position to an angle of 25 degrees, each degree of tilt being accurately measured by a scale. Both tables slide easily to any point of adjustment on machined ways, and can be locked in position by simply turning the plastic handle.

The tables are slotted to accommodate the protractor angle guide furnished with the machine, and are grooved to keep the working surface free from grit and dirt. For wet grinding with a diamond cup-wheel, the right side of the machine can be fitted with a reservoir mounted directly over the wheel on the cast-iron guide. Drip feed to the diamond wheel is controlled by a needle valve. The spindle has a maximum speed of 2100 R.P.M., power being supplied through adjustable V-belts driven by a 1-H.P. electric motor. The grinder can also be furnished with cup-wheels on both sides for right- or left-hand grinding at a spindle speed of 1750 R.P.M. under switch control. 77

To obtain additional information on equipment described on this page, see lower part of page 210.



Midget Clamp Designed for Aircraft Work

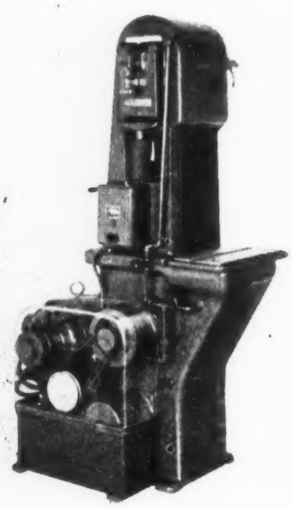
Midget Toggle Clamp

Knu-Vise, Inc., 16859 Hamilton Ave., Detroit, Mich., has brought out a Model No. 830 Midget toggle clamp adapted for aircraft work. The clamp is furnished complete with spindle and rubber cap, as shown in the illustration. Although only 4 inches long by 1 1/2 inches high, this clamp will exert a pressure in excess of 500 pounds. 78

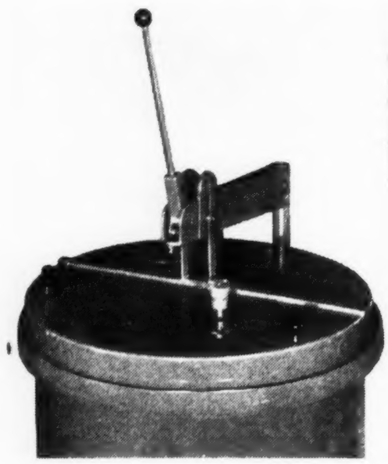
Force-Feed Coolant System for Porter-Cable Belt Grinder

A circulating, force-feed coolant system has been brought out by the Porter-Cable Machine Co., Syracuse, N. Y., for application to the company's Type G-8 wet abrasive belt grinder. This new system, connected to the base of the grinder as shown in the accompanying illustration, is operated by V-belt connection to the main-drive pulley of the machine. The cast-iron frame encloses a reservoir, gear type pump, and a cylindrical straining screen. A removable head above the screen gives accessibility for cleaning. All moving parts are completely guarded.

This circulating unit permits using the machine in any part of the plant without connections to water or drain pipes, and makes use of any desired liquid coolant. It also permits the reclamation of particles of material removed by the grinding action. The wet-belt grinding method available with this machine is adapted for surfacing operations on metals, plastics, minerals, and other materials. 79



Porter-Cable Belt Grinder with New Coolant System



"Homocarb" Cooling Unit Equipped with Lid-lifter

Lid-Lifter for "Homocarb" Cooling Unit

An improved lid-lifter is now incorporated in the "Homocarb" cooling unit made by the Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa. The lifter consists of a lever acting on a roller-fulcrum in such a manner that the cover can be easily lifted. 80

Grinding-Wheel Dresser

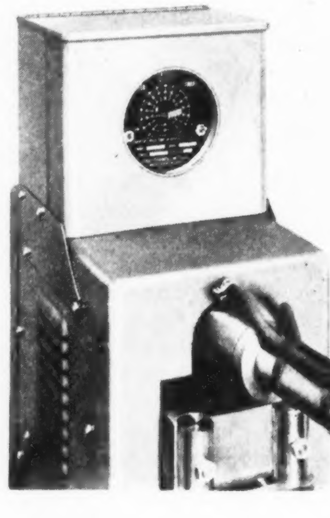
The Ideal Commutator Dresser Co., 1011 Park Ave., Sycamore, Ill., has brought out an abrasive-wheel type grinding-wheel dresser that is said to have a cutting and truing effect almost equal to that of a diamond. The cutting wheel is held in a protective metal housing which deflects the grindings away from the operator. A large handle facilitates use of the tool. The cutting wheel can be easily replaced.

Besides general cleaning and truing of a grinding wheel, this dresser can be used for truing cut-up, uneven sides of wheels, dressing out deep grooves and out-of-roundness, and restoring the balance of wheels that have been worn out of true. It can also be used to shape wheels for form-grinding operations. The length is 13 3/4 inches, and the weight, 3 1/8 pounds. 81

Automatic Timer for Ace Spot-Welders

Ace spot-welders, made by the Pier Equipment Mfg. Co., Milton and Cross Sts., Benton Harbor, Mich., are now available with a new type of precision timer designed to automatically control the welding time period and eliminate the human error element, increase production, and assure uniform welds. The operator simply feeds the work through the welder. Easy adjustment is provided by three concentric scales on a direct-reading dial. The adjustment range is from three to forty-seven cycles, corresponding to 3/60 to 47/60 of a second, calibrated in one-cycle steps. Once the timing dial is set for a particular job, depressing the foot-pedal energizes the welding circuit and timing element.

At the end of the selected time period, the contactor is automatically tripped and the welding circuit opened. This timer is of the electronic or tube type, and maximum timing variation is controlled to plus or minus 1/120 second on short-time welding. 82



Ace Spot-welder Equipped with Automatic Timer

To obtain additional information on equipment described on this page, see lower part of page 210.

"Micron" Gear-hobbing Machine

"Micron" Gear-Hobbing Machine

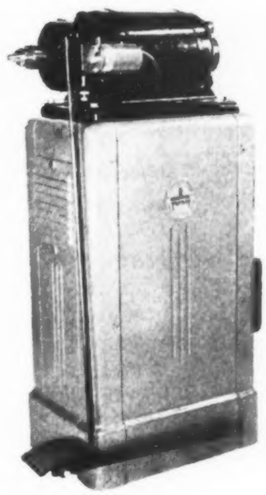
A gear-hobbing machine of a type similar to the Swiss "Mikron" is now being marketed by the Triplex Machine Tool Co., 125 Barclay St., New York City. This American-built product is designated the "Micron" spur-gear hobbing machine. It has a capacity for hobbing spur gears and pinions up to 2 inches in diameter, 20 diametral pitch, with a maximum length of 1.60 inches. It is designed to cut accurate brass and steel wheels and pinions, such as are used in watches, meters, gages, and other precision instruments.

A set of index change-gears for any number of teeth between 6 and 390 is furnished with each machine. Additional change-gears for any number of teeth within this range can also be furnished. One hob will cut all gears of identical diametral pitch, regardless of the number of teeth if the tooth shape is of the involute type. For teeth of the cycloidal shape, however, an individual hob is required for each particular number of teeth. A set of feed change-gears for six feeds between 0.004 and 0.030 inch per revolution of the hob is furnished with each machine.

The automatic longitudinal feed of the hob-spindle slide is engaged by a handwheel and stopped automatically when the work is finished. The driving motor is also switched off simultaneously. A 1/3-H.P. motor inside the pedestal drives the hob-spindle through a pair of two-step pulleys and a flat belt. Hob spindle speeds of 518 R.P.M. for steel and 1030 R.P.M. for brass are regularly provided, but additional motor pulleys can be furnished for different speeds. A motor-driven pump furnishes coolant from a tank in the base. 83

Walker-Turner Polishing Lathes

A foot-operated speed lathe designed for a wide variety of polishing, burring, and lapping operations on ferrous and non-ferrous metals and plastics has been developed by the Walker-Turner Co., Inc., South Ave., Plainfield, N. J. The chuck of this machine will take tubing, hexagonal shapes, and round pieces up to 2 inches in diameter.



Foot-controlled Polishing Lathe Made by Walker-Turner Co.

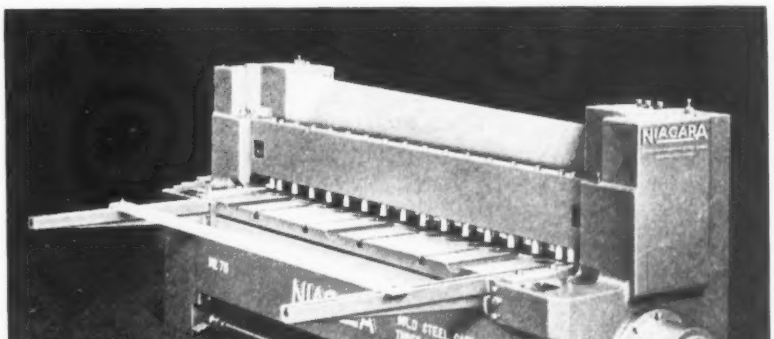
These machines are being used in the aviation industry for polishing engine parts, such as valves, push-rods, and bolts. They are equipped with three-phase motors of direct or gear drive type. A foot-pedal controls the motor switch and a synchronized brake, which stops the spindle almost instantly when the motor circuit is broken.

The machine is available with a two-speed motor and either Jacobs chucks of 1/2- to 3/4-inch capacity or a 4-inch three-jaw universal lathe chuck. The speeds range from 950 to 7200 R.P.M. The over-all height is 42 inches, and the weight ranges up to 300 pounds, depending on the motor used. 84

Niagara Power Squaring Shears

A new Series No. 7 line of power squaring shears built in 4- to 12-foot cutting lengths, with capacities from 1/4 inch to 10 gage, has been brought out by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. These shears are of under-drive design with the drive, including flywheel, gearing, clutch, eccentrics, and connections, completely enclosed and operating in a bath of oil.

Improvements have been made in the design of these presses to obtain straight shearing to within a few thousandths inch and to eliminate camber or curl of narrow strips. More working strokes per hour are made possible by the high operating speed of 60 strokes per minute, combined with convenient, safe handling of stock.



Power Squaring Shears Brought out by Niagara Machine & Tool Works

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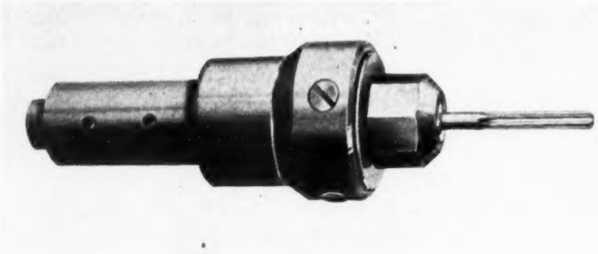
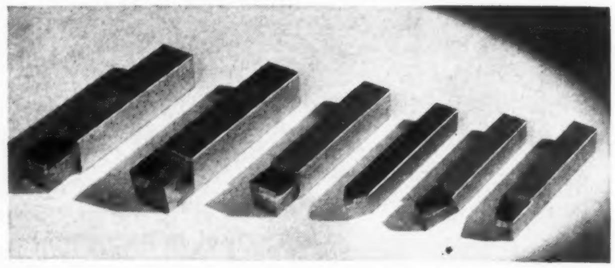


Floating Chuck for Automatic Screw Machines, Made by Universal Engineering Co.

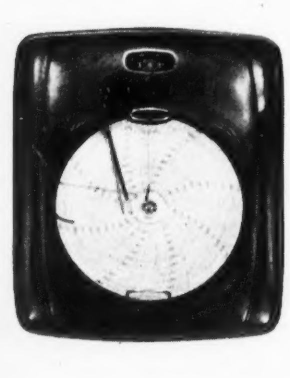


Carbide-tipped Tools Brought out by the Tungsten Carbide Tool Co.

A self-measuring, ball-bearing, parallel back gage, adjustable to increments of 1/128 inch, a front gage with front brackets, and side and bevel gages are provided as standard equipment. 85

Foxboro Improved Stabilog Controller

An improved Stabilog controller, known as the Model 30, for use in applications involving the control of temperature, pressure, liquid level, or flow has been placed on the market by the Foxboro Co., Foxboro, Mass.



Stabilog Controller Made by the Foxboro Co.

As shown in the illustration, the control is mounted in the new universal rectangular case. When panel mounted, the instrument extends only 3/4 inch from the panel surface. A dual pressure indicator, visible through an opening in the door, replaces the two small gages customarily used. Unit construction simplifies replacement of the measuring system, changing the type of control, or any other major servicing of the mechanism that may be necessary. 86

Floating Chuck for Automatic Screw Machines and Turret Lathes

The Universal Engineering Co., Frankenmuth, Mich., has recently placed on the market a floating chuck designed especially for operation in a horizontal position on automatic screw machines and turret lathes. Means are provided for making adjustments to counterbalance the weight of various tools. This feature permits increased feeds to be employed with chucks of this kind without danger of marring or bellmouthing the work.

The construction is such that the spring pressure is exerted from four different directions, and can be increased and decreased in any direction by means of the adjusting screw. These chucks have ball-bearing drives, both for the lateral movement and for thrust. They are especially adapted for use in drilling, counterboring, reaming, and for any tool requiring piloting from the bore. 87

Carbide-Tipped Standard Tools

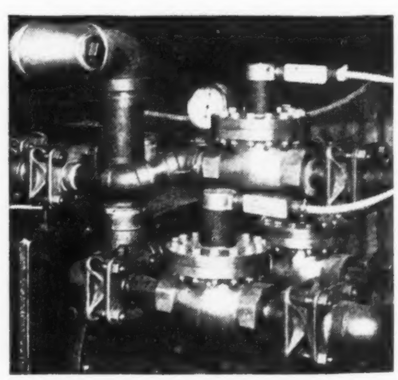
The Tungsten Carbide Tool Co., a subsidiary of the Michigan Tool Co., Detroit, Mich., has brought out a complete line of carbide-tipped cutting tools comprising six styles and forty-six stocked sizes. All tools have diamond-ground edges and are ready for immediate use. Types suitable for cast iron, non-ferrous metals, and steel are included in this line.

The tools are designed to meet practically all turning, boring, and facing requirements, and can be readily converted by the user into special shapes by simple grinding operations. All styles and sizes in four grades are regularly available, and other grades of Vascoloy, Carboloy, Kennametal, or Firthite can be obtained on special order. For identification, the styles and sizes suitable for cutting cast iron and non-ferrous metals have gray shanks, while those for steel have black shanks. 88

Atkomatic High-Pressure Valves

The standard line of electrically operated Atkomatic valves, for operating pressures up to 300 pounds per square inch, made by E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind., has been recently supplemented with a line of high-pressure valves for operating pressures up to 3000 pounds per square inch. These valves are available in 1/2, 3/4, and 1 1/2-inch sizes for use in the general industrial field for automatic and remote control. When used on liquids, a limited range of timing control may be obtained on opening and closing speeds.

The accompanying illustration shows Atkomatic high-pressure valves operating a 250-ton press at 1000 pounds oil pressure, with full remote control. When the press hits full load, the pressure imme-



Atkomatic Valves Operating 250-ton Press by Remote Control

To obtain additional information on equipment described on this page, see lower part of page 210.

diately goes to the original accumulator pressure with no time lag, due to the special automatic arrangement. 89

Improved Surface Plates

Surface plates of improved design are being manufactured by the Machine Products Corporation, 6771 E. McNichols Road, Detroit, Mich. These surface plates have been designed to resist deflection under load and retain their accuracy through the use of a special form of ribbing that supports the plate. The rigidity essential to precision work is maintained over the entire surface from the center to the edges, around which ample clamping space is provided.

Surface Plate Made by Machine Products Corporation

The plate is made of specially processed iron of uniform texture, strength, and solidity. A special heat-treatment is employed to relieve casting and machining strains and prevent distortion and changes from taking place after the surface has been scraped. After scraping, the surface is checked by master plates. The sizes range from 10 by 15 to 48 by 96 inches, and are carried in stock ready for shipment. Stands for the larger size plates are available. A complete line of angles and cubes made of the same material is also being manufactured by this company. 90

Gray-Mills Portable Coolant Pump

A portable coolant pump that can be easily attached to any machine tool has just been placed on the market by the Gray-Mills Co., Inc., 215 W. Ontario St., Chicago, Ill. The pump comes with all the necessary fittings to attach it to the machine tool, and need only be plugged into the electric supply line to begin operation. It will

Gray-Mills Portable Coolant Pump

handle coolants of all but extreme viscosities. Standard "Flo-Bac" pans are also available to provide coolant return for any machine not so equipped. This pump is recommended for use with drill presses, lathes, tapping machines, cut-off saws, grinding machines, abrasive finishing machines, etc. 91

F. & H. Universal Vise and Lathe Center

A fully universal vise for use with surface grinders and drill presses, as well as on light milling work, has been announced by the F. & H. Mfg. Co., 6024 Ellery St., Detroit, Mich. This vise, shown in Fig. 1, is readily adjustable to a horizontal, vertical, or any intermediate position. A calibrated scale is provided to facilitate the correct angular setting in the horizontal

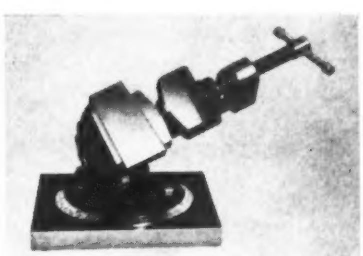


Fig. 1. F. & H. Universal Vise

Fig. 2. F. & H. Lathe Center

plane. In addition to the usual parallel jaws, Equi-Hold swivel jaws are furnished to be used when clamping combination angular pieces. The vise is well adapted for forming tools, chip breakers, and for all compound angular work.

A new lathe center with an axial oil-groove, as shown in Fig. 2, has also been brought out by the same company. 92

Anchor Type Elastic Stop-Nuts

Anchor type lock-nuts which have been used successfully in aircraft construction are now being offered for blind mounting applications on general industrial equipment by the Elastic Stop Nut Cor-

Anchor Type Elastic Stop-nuts for Blind Mounting

poration, 2332 Vauxhall Road, Union, N. J. These nuts are designed to provide vibration-proof fastenings for removable plates used to cover hand-holes, access and inspection openings, and for other blind mount attachments. When installed, the anchor nuts are permanently riveted to the inside of the structure.

These nuts are available in a wide range of sizes, materials, and threads. Each nut has the basic Elastic Stop self-locking feature—a fiber locking collar which is an integral part of the nut. When the bolt is turned through the nut, it impresses a thread in the fiber collar, thus forming a moisture-tight seal around the bolt and maintaining a resilient braking action which prevents the bolt from backing out. 93

Nemco Flexible Coupling

A new type of flexible coupling in which use is made of a four-layer, high-carbon, Swedish piano wire flexible core, has been placed on the market recently by the

To obtain additional information on equipment described on this page, see lower part of page 210.

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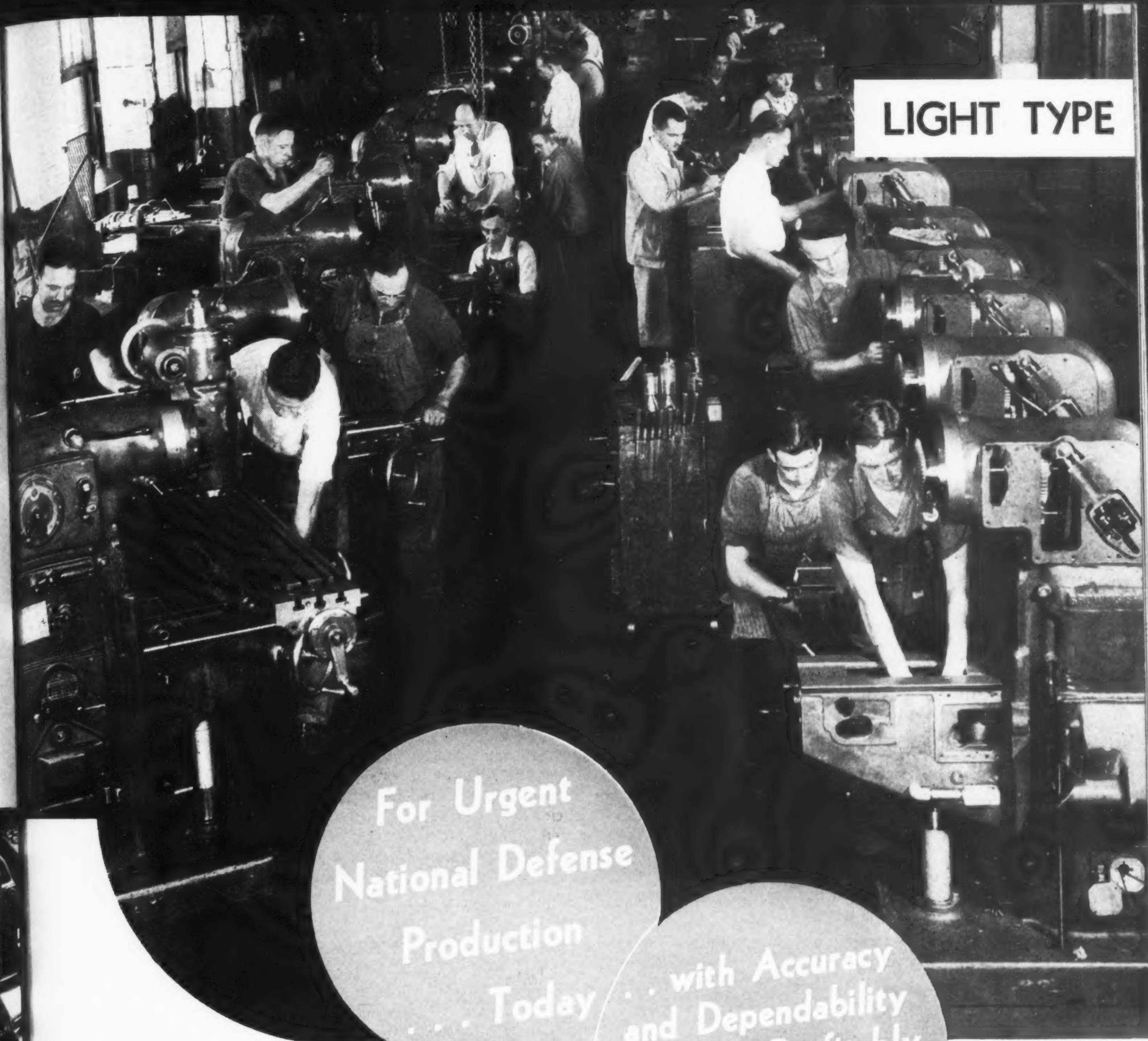

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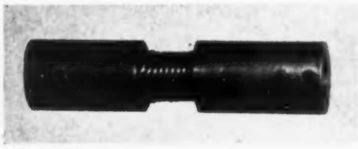
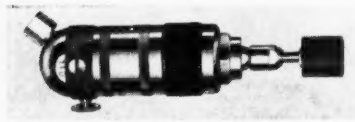


Nemco Flexible Coupling

National Electric Manufacturers Co., 60 E. 42nd St., New York City. The piano wire core is fused by high pressure into metal butt ends, which are available with various sized bores. The amount of axial misalignment and angularity that a particular size of this type of coupling will take care of is governed by the length of core between the butt ends. These couplings are available in a range of sizes designed to be used with motors of 1/4 to 25 H.P. 94

Compact Pneumatic Grinder

The Aro Equipment Corporation, 115 Madison St., Bryan, Ohio, has recently placed on the market a grinder designed to meet the demand for a pneumatic tool that is compact and sufficiently light in weight for one-hand operation. This grinder is only 6 1/4 inches long, has a speed of 17,000 R.P.M., and will accommodate wheels up to 2 inches in diameter. It is equipped with large precision type ball bearings, and is available with either lever or button throttle, and with spindle extension and collets of various sizes. 95



Aro Pneumatic Grinder

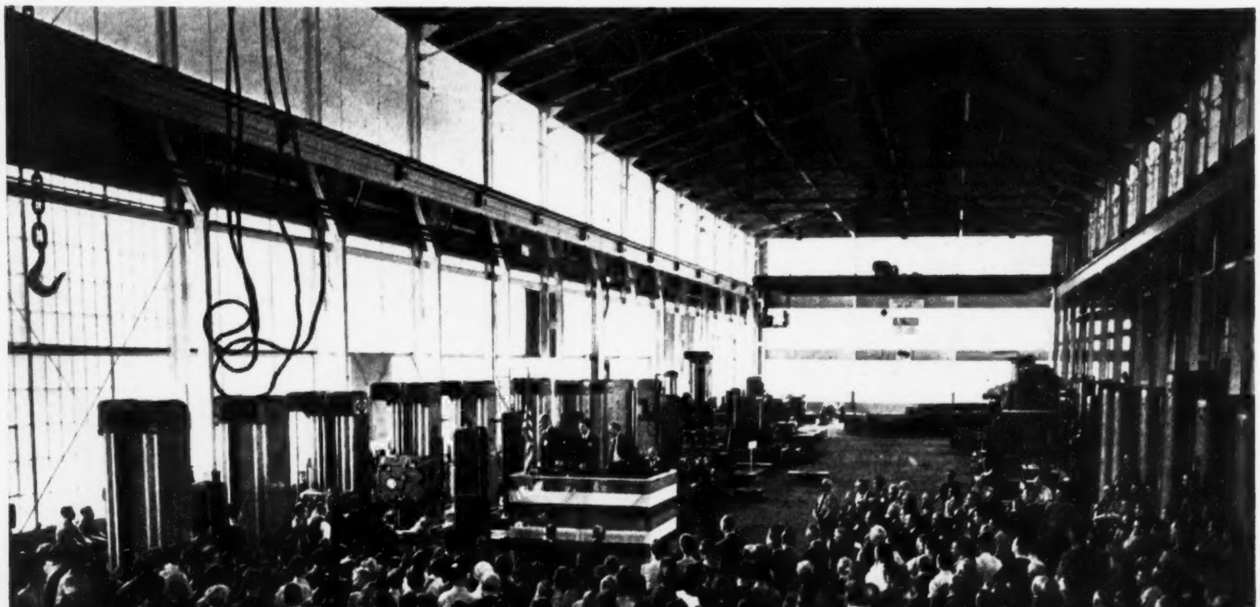
* * *

The National Machine Tool Builders' Association states that, by the end of this year, 300,000 new machine tools will have been built in 1940 and 1941. At first, it is difficult to imagine why even our vast armament program should require so many machines; but practically every metal part entering into armament production must have a great many machining operations performed on it. For example, in the Garand rifle there are seventy-two distinct metal parts. Some of these require up to one hundred machining operations. A modern bomber is composed of over 30,000 parts on which a total of approximately 200,000 machining operations are performed.

Chambersburg Engineering Co. Erects Machine Tool Plant

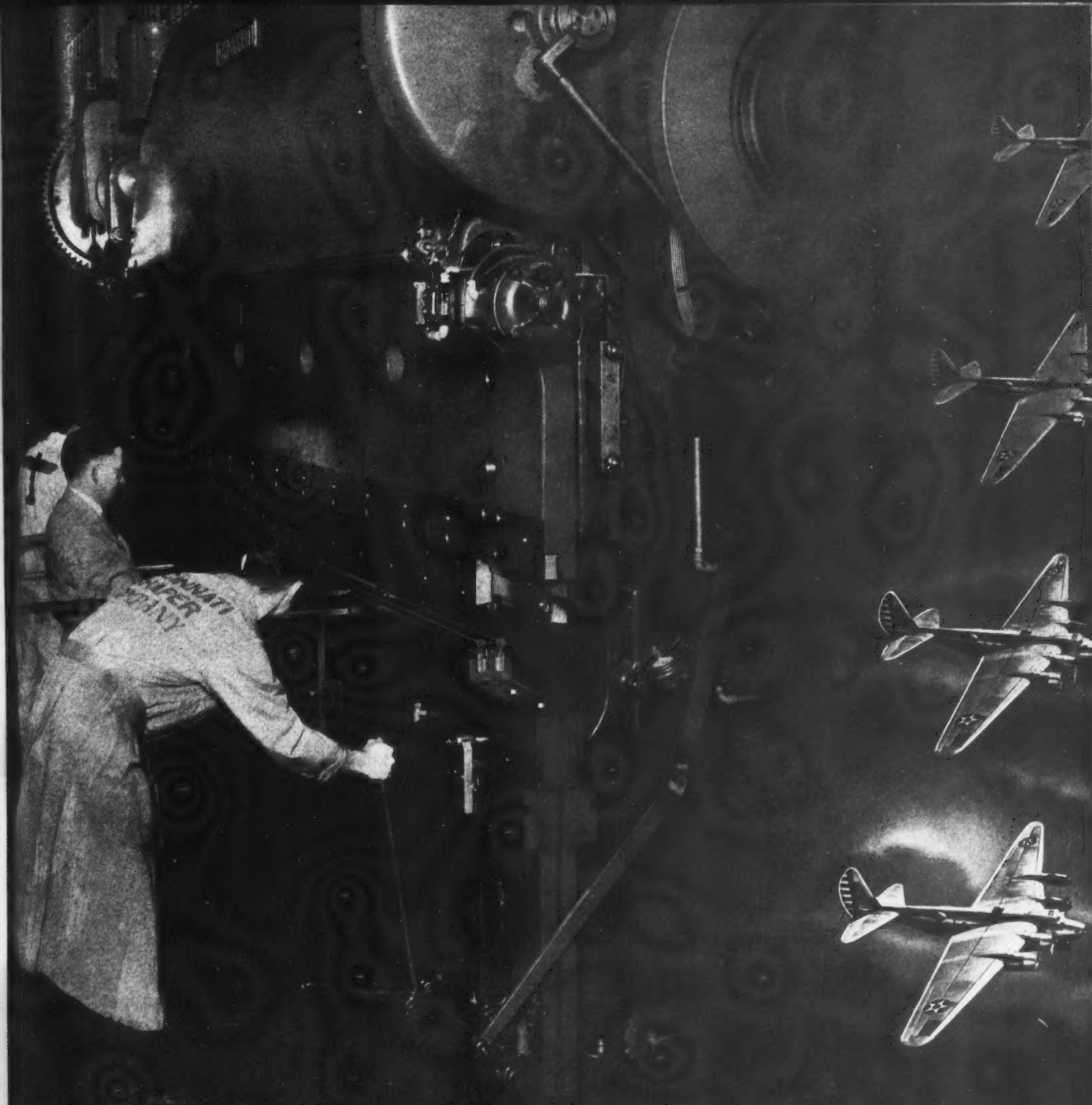
A new plant, to be devoted to the building of 5-inch horizontal boring, drilling, and milling machines under a sub-contract from William Sellers & Co., Inc., Philadelphia, Pa., has recently been completed by the Chambersburg Engineering Co., Chambersburg, Pa. The new plant comprises a main building 300 by 87 feet, and a cleaning and painting bay 90 by 60 feet. In addition, there are an auxiliary heating plant, electrical sub-station, and compressor building. Ground for the new building was broken December 5, 1940; the building was completed April 8, this year; production was started May 1, and the first 5-inch machine was completed about the middle of September, at which time dedication ceremonies were held at the plant. Since these machine tools are built for the Navy, a large number of navy officials were present, in addition to important state and local officials. The dedication ceremonies were brief, so that production was interrupted only forty-five minutes.

On the following Sunday, the general public of Chambersburg and vicinity was invited to inspect the new plant.



The Chambersburg Engineering Co.'s New Plant for Building Horizontal Boring, Milling, and Drilling Machines as it Appeared at the Dedication Ceremonies

To obtain additional information on equipment described on this page, see lower part of page 210.



Cincinnati Press Brakes Form Sheets for Sky Ships . . .

The aircraft industry has used Cincinnati Press Brakes since airplanes were first built of metal. If you are an aircraft manufacturer or plan to sub-contract sheet metal work for airplane builders, write us for recommendations.

Cincinnati Press Brake illustrated is 14'-6" between housings; has 16'-8" overall die surface.

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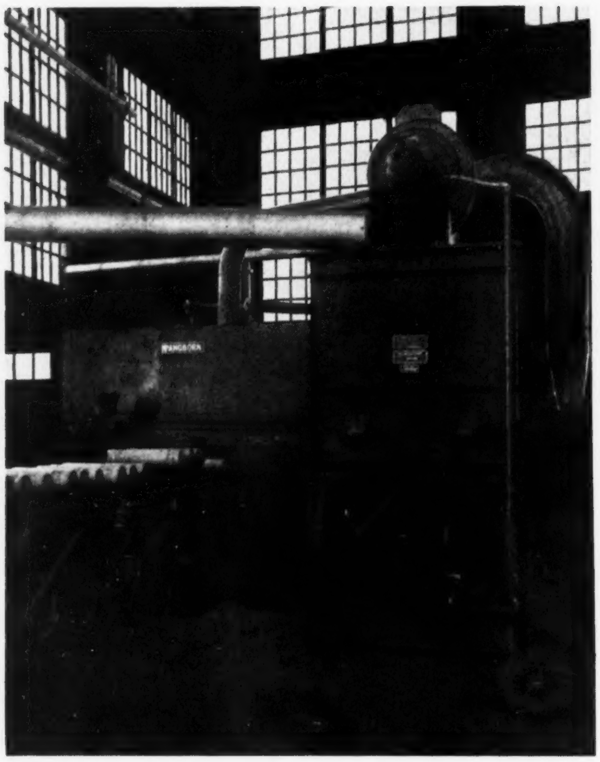


Fig. 1. Loading End of Pangborn Blast-cleaning Equipment, which Handles 155-millimeter Shells in the Plant of the Baldwin Locomotive Works

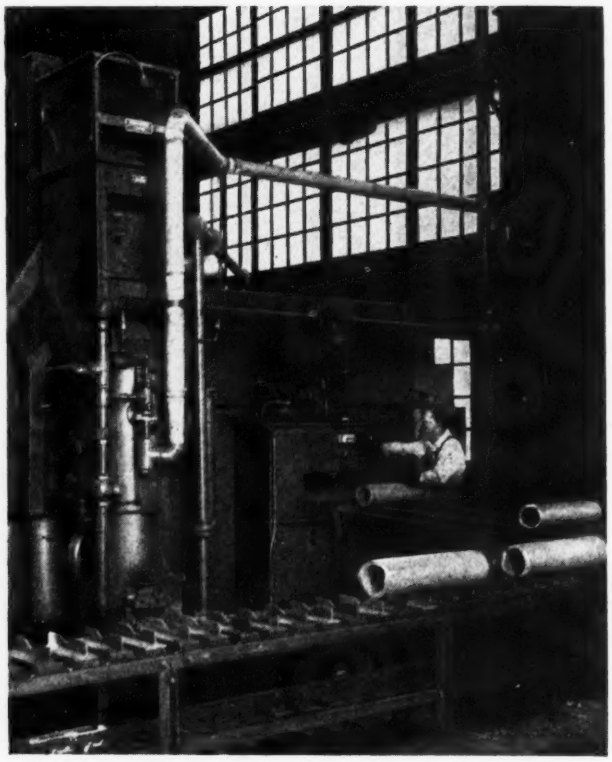


Fig. 2. As Shells Leave Automatic Blast-cleaning Equipment, They are Uniform in Appearance and Free from Scale, Burnt Sand, and Dirt

Cleaning 155-Millimeter Shells on a Mass Production Basis

Shells of the 155-millimeter size are being blast-cleaned on a mass production basis at the Baldwin Locomotive Works, Philadelphia, Pa., by automatic equipment supplied by the Pangborn Corporation, Hagerstown, Md. The loading end of the equipment is shown in Fig. 1, and the unloading end in Fig. 2. A continuous run of shells reaches this blast-cleaning equipment over a conveyor system, and as the shells are passed mechanically through the equipment, they are cleaned thoroughly, both on the inside and outside walls.

All the abrasive is removed from the shells by the action of an inverting mechanism. When the shells are automatically ejected from the machine and picked up by the take-away conveyor, they are of uniform appearance and free from scale, burnt sand, and dirt.

Avoiding Explosions in Industrial Plants

The G & N Mfg. Co., Cleveland, Ohio, builder of die-casting machines, has requested the United States Bureau of Standards to introduce a regulation making it mandatory for nitrogen producers to sell nitrogen in bottles with left-hand threads on the valve fittings. This request has been prompted by an explosion that recently occurred in a die-casting plant, when three men were killed and a fourth injured. The explosion occurred after the accumulator tank on a die-casting machine had accidentally been filled with oxygen instead of nitrogen, as intended. When the oxygen came into contact under pressure with the oil used in the operation of the machine, the oil ignited and an explosion followed. The disaster was made possible by the fact that the workman introduced oxygen into the accumulator tank. If the valve on the oxygen bottle had been different from that of the nitrogen container, the mistake could not have been made. With the fittings threaded left-hand, and all nitrogen inlets having corresponding threads, it would be impossible to attach an oxygen bottle.

* * *

Expansion of Machine Tool Industry

According to figures collected by the National Machine Tool Builders' Association, 85 per cent of the country's machine tool plants are operating their important departments from 100 to 168 hours per week to speed the production of machine tools for national defense. The average work week per man throughout the machine tool industry is 49.4 hours. According to the National Industrial Conference Board, this is the highest average for any American industry.

Since the defense program was inaugurated, seventy-two manufacturers who did not formerly build machine tools have engaged in this line. In addition, thirty-six machine tool manufacturers have placed sub-contracts for complete machines with firms who formerly did not build machine tools.

The SUPER SERVICE RADIAL is acclaimed for
NAVAL CONSTRUCTION
★
"More holes per dollar"—a statement always associated with the SUPER SERVICE RADIAL stands out to particular advantage in heavy duty drilling assignments for Naval and Merchant Shipbuilding. Note in this close-up action photograph how conveniently the operator controls the SUPER SERVICE RADIAL at the N. Y. Shipbuilding Corporation . . . the low, centralized position of all controls at the head contributes to tangible savings in time and a great reduction in operator fatigue. The New York Shipbuilding Corporation reports not only definite savings from the use of the SUPER SERVICE RADIAL, but also "an improvement as to accuracy, speed and ease-of-handling".
THE CINCINNATI BICKFORD TOOL CO.
OAKLEY, CINCINNATI, OHIO, U. S. A.
CINCINNATI BICKFORD
Drilling Condenser Head with the Super Service Radial at the New York Shipbuilding Corporation.

NEWS OF THE INDUSTRY

California

FRAY MACHINE TOOL Co., Glendale, Calif., was recently purchased by JAMES H. RICHARDS and a group of Glendale business men. Mr. Richards, who was previously general manager of the company, is now president and general manager. LOCK J. HALES is secretary-treasurer. The company will continue to do business under the name of the Fray Machine Tool Co., and will manufacture the same products, which include "All-Angle" milling machines, Fray micrometer offset boring heads, and "All-Angle" motors.

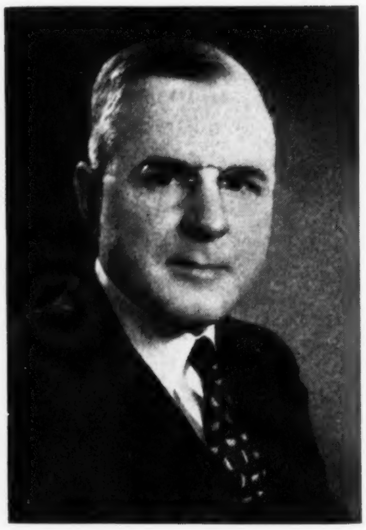
KENT-OWENS MACHINE Co., Toledo, Ohio, has appointed the ECCLES & DAVIES MACHINERY Co., 1910 Santa Fe Ave., Los Angeles, Calif., agent in that territory for the Kent-Owens power milling machines. C. F. BULOTTI MACHINERY Co., 829 Folsom St., San Francisco, Calif., has been appointed exclusive agent in the San Francisco territory.

HARLAN A. MESSNER has been appointed sales engineer by the Ohio Crankshaft Co., Cleveland, Ohio, and transferred from Cleveland to the West Coast to head the district sales and service of Tocco electrical induction surface hardening and heating equipment. Mr. Messner's headquarters will be at 118½ South Flores, Los Angeles, Calif.

LITTLEFUSE INC., 4757 Ravenswood Ave., Chicago, Ill., has just opened a new plant at El Monte, Calif., twelve miles east of Los Angeles. This plant will supplement the Chicago factory in the manufacture of electric fuses and fuse mountings for instruments, aircraft, radio, etc.

Illinois

LOUIS B. NEUMILLER has been elected president of the Caterpillar Tractor Co., Peoria, Ill. He began his association with the company twenty-six years ago as a stenographer and blueprint clerk in the engineering department. In time, he became drafting-room supervisor; in 1922, he was made parts manager and in 1931, general service manager. In 1937, he became sales manager for the central division, and about a year later he was made a vice-president of the company, in which position he was in charge of service, industrial relations, training and public relations.



W. F. Kurfess, Recently Placed in Charge of Steel Division of Bureau of Ships

W. F. KURFESS, vice-president of Joseph T. Ryerson & Son, Inc., Chicago, Ill., has been ordered to active duty in the United States Navy. He will take charge of the Steel Division of the Bureau of Ships in Washington. During the first World War Mr. Kurfess served as a lieutenant in the Navy and continued his association with the Navy in the reserve force with the rank of lieutenant commander. He has been associated with the Ryerson organization since graduating from Purdue University in 1912.

CHARLES BRUNING Co., INC., manufacturer of sensitized black-and-white printing papers and developing machines, is now occupying its new plant and office building at 4700 W. Montrose Ave., Chicago, Ill. The plant includes a machine shop occupying an area of approximately 14,600 square feet for the manufacture and assembly of the Bruning printing and developing equipment.

SHELDON MACHINE Co., INC., Chicago, Ill., builder of precision lathes, arbor presses, and machine vises, has moved into a new monitor-type plant at 4240-4258 Knox Ave. The new plant triples the production capacity of the company. It is not a "war" plant, but is built entirely by private capital as the permanent location of the Sheldon company.

MAURICE N. LANDIS has been appointed manager of the Metallurgical and Research Division of the La Salle Steel Co., Chicago, Ill.; HENRY N. LANDIS will be assistant manager of metallurgical engineering; and A. FRANK GOLICK, assistant general manager of sales.

KUX-LOHNER MACHINE Co. announces that the firm will hereafter be known as the KUX MACHINE Co., and will be located in a new and larger plant at 3930-44 W. Harrison St., Chicago, Ill.

SMALL MOTORS, INC., Chicago, Ill., announces the removal of the company from 1733 Milwaukee Ave., to new and enlarged offices and factory at 1308-22 Elston Ave.

Indiana

FRANK A. BURNETT has been transferred to the Indianapolis office of Ampco Metal, Inc., Milwaukee, Wis., which is located at 3335 College Ave., Indianapolis, Ind. Mr. Burnett was previously connected with the Cincinnati office of the company. E. A. SVOBODA, previously located in Indianapolis, will take charge of the Cleveland office, replacing J. A. MORRISON, who has resigned. RUSSELL E. CAMPBELL has joined the West Coast Division of the company.

MODERN MOTOR DRIVES, INC., Elkhart, Ind., is now making the complete line of motor drives formerly manufactured by the QUALITY HARDWARE & MACHINE CORPORATION, Chicago, Ill.

A. W. S. HERRINGTON, president of the Marmon-Herrington Co., Inc., Indianapolis, Ind., has been nominated for president of the Society of Automotive Engineers for 1942.

Michigan and Wisconsin

DOW CHEMICAL Co., Midland, Mich., has been selected as the recipient of the 1941 award for chemical engineering achievement presented by the magazine *Chemical and Metallurgical Engineering* to that company which, in the opinion of the committee of awards, has "contributed the most meritorious advances to the industry and profession." The outstanding achievement of the Dow Chemical Co. was the development of a process of recovering magnesium metal from sea water in a huge plant recently completed at Freeport, Tex. Presentation of the award will be made at a dinner in New York on December 2, in connection with the Eighteenth National Exposition of the Chemical Industries at Grand Central Palace.

DETROIT BALL BEARING Co., 110 W. Alexandrine Ave., Detroit, Mich., is erecting a building at 48 W. Fulton

Typical picture in American industry *today*—a battery of Ex-Cell-O Standard Precision Boring Machines turning out various defense parts with extreme accuracy, on a high production, low unit cost basis. *Tomorrow*, these same standard Ex-Cell-O machines—each of which is built for flexible use and ease of operation in precision work—will prove profitable to their owners when the swing over to non-defense products *must* be made.

Sweet music to the ears of today's buyers of Ex-Cell-O precision machines will be the steady sound of those same machines in operation *tomorrow* . . . when world peace will bring a definite advantage to manufacturers in this country whose present equipment can be adapted to civilian needs, quickly and profitably, and still meet the new high standard of speed and accuracy in production.

Every standard Ex-Cell-O machine—for boring, for grinding threads, for other precision machining—is designed and built to do most efficiently and at low cost the extremely accurate job demanded today for defense . . . to meet these same exacting requirements that will unquestionably be essential tomorrow if profits in competitive markets are to be assured.

Wherever an Ex-Cell-O precision machine is installed today, one of the most important steps in the planning for the inevitable tomorrow is already taken.

EX-CELL-O CORPORATION • DETROIT, MICHIGAN

XLO

Precision **THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS**

St., Grand Rapids, Mich., which is expected to be ready for occupancy before the end of the year. The company has also established a branch at Saginaw, Mich., to expedite deliveries to the defense industries in that area.

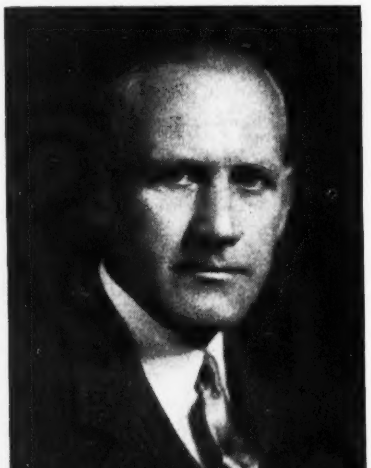
JOHN BROOKS, assistant production manager in charge of customer contacts at the AC Spark Plug Division of the General Motors Corporation, Detroit, Mich., has been lent to the British Purchasing Commission as an adviser on planning and production.

W. G. PRASSE, formerly eastern representative of the Oilgear Co., Milwaukee, Wis., has been appointed sales manager.

New England

CHARLES R. POLLOCK has been appointed district manager for the Detroit and Toledo areas of the Sentry Co., Foxboro, Mass., manufacturer of industrial electric furnaces for heat-treatment and melting of metals. Mr. Pollock will have offices at 7450 Melville Ave., Detroit, Mich. CHARLES R. BRINGMAN will represent the company in Florida. He will have offices at 310 E. Orlando Ave., Orlando, Fla.

HARRY L. BILL was recently elected vice-president and general manager of the Greenfield Tap & Die Corporation, Greenfield, Mass., succeeding HOWARD M. HUBBARD, who has resigned. Previous to his association with the Greenfield Tap & Die Corporation, Mr. Bill reorganized and managed United Aircraft Products, Inc., Dayton, Ohio, of which he was president and general manager. Prior to that he was vice-president and general manager of the Pioneer Instrument Co., Brooklyn, N. Y., a subsidiary of the Bendix Aircraft Corporation.



Harry L. Bill, Vice-president and General Manager of the Greenfield Tap & Die Corpn.

H. R. BRISTOL has been transferred from the Chicago office of the Bristol Co. to the Boston office of the company. He will make his headquarters in the Consolidated Bldg., 250 Stuart St., Boston. J. E. BOOTH will take over the Chicago district, formerly handled by Mr. Bristol.

W. J. GREENE, general sales manager of the L. S. Starrett Co., Athol, Mass., has been made vice-president in charge of sales, J. R. CULLEN, long associated with the export department, has been appointed export manager.

H. F. ROBERTSON has been appointed district manager of the New England office and warehouse of the Jessop Steel Co. at 626 Capitol Ave., Hartford, Conn., succeeding the late Hugh A. Scallen. J. W. STRANAHAN, formerly Cleveland representative, has been transferred to the Philadelphia office at 225 S. 15th St. PAUL R. WENDT, another Cleveland representative, is now at the Toronto office at 530 Front St. West. H. PRESTON BERRY has been transferred from the Washington, Pa., plant to do special sales work from the Chicago office at 1742 Carroll Ave.

EARL C. MAUND has joined Manning, Maxwell & Moore, Inc., of Bridgeport, Conn., in a sales and engineering capacity. His engineering services will cover the products of Consolidated safety valves, Hancock valves, American instruments, and Ashcroft gages.

New Jersey

ROBERT H. ABORN, a member of the staff of the Research Laboratory of the United States Steel Corporation, Kearney, N. J., was presented with the Lincoln Gold Medal for 1940-1941 at the annual meeting of the American Welding Society in Philadelphia. This medal, which was donated to the Society by James F. Lincoln, president of the Lincoln Electric Co., Cleveland, Ohio, was awarded to Mr. Aborn for his paper "Metallurgical Changes at Welded Joints and the Weldability of Steels."

JOHN F. MCKERNAN, until recently chief of equipment in the production division of the Office of Production Management, Washington, D. C., has returned to the Western Electric Co. as manager of defense program planning, with headquarters at Kearney, N. J. He will coordinate production on the company's $100,000,000 defense orders.

WESTINGHOUSE ELECTRIC ELEVATOR Co., Jersey City, N. J., has been awarded the Navy "E" pennant for "excellence in production of navy gun mounts." With this award also goes the large Naval Ordnance flag and a badge carrying the designation "E" to be worn by every worker in the plant.

New York

JOHN J. BALUN has been selected as the winner of the Charles T. Main Award of the American Society of Mechanical Engineers for the year 1941. Mr. Balun graduated from the College of Engineering of the University of Detroit with the degree of mechanical engineer last June. The Charles T. Main Award is the principal undergraduate award in mechanical engineering in the United States and Canada, and is presented each year by the Board of Honors and Awards of the American Society of Mechanical Engineers for the best essay dealing with the influence of the profession upon public life. The award consists of a $150 cash prize and an engraved certificate. It is presented at the annual meeting of the Society in December. Mr. Balun is now employed by the General Electric Co. at Schenectady, N. Y.

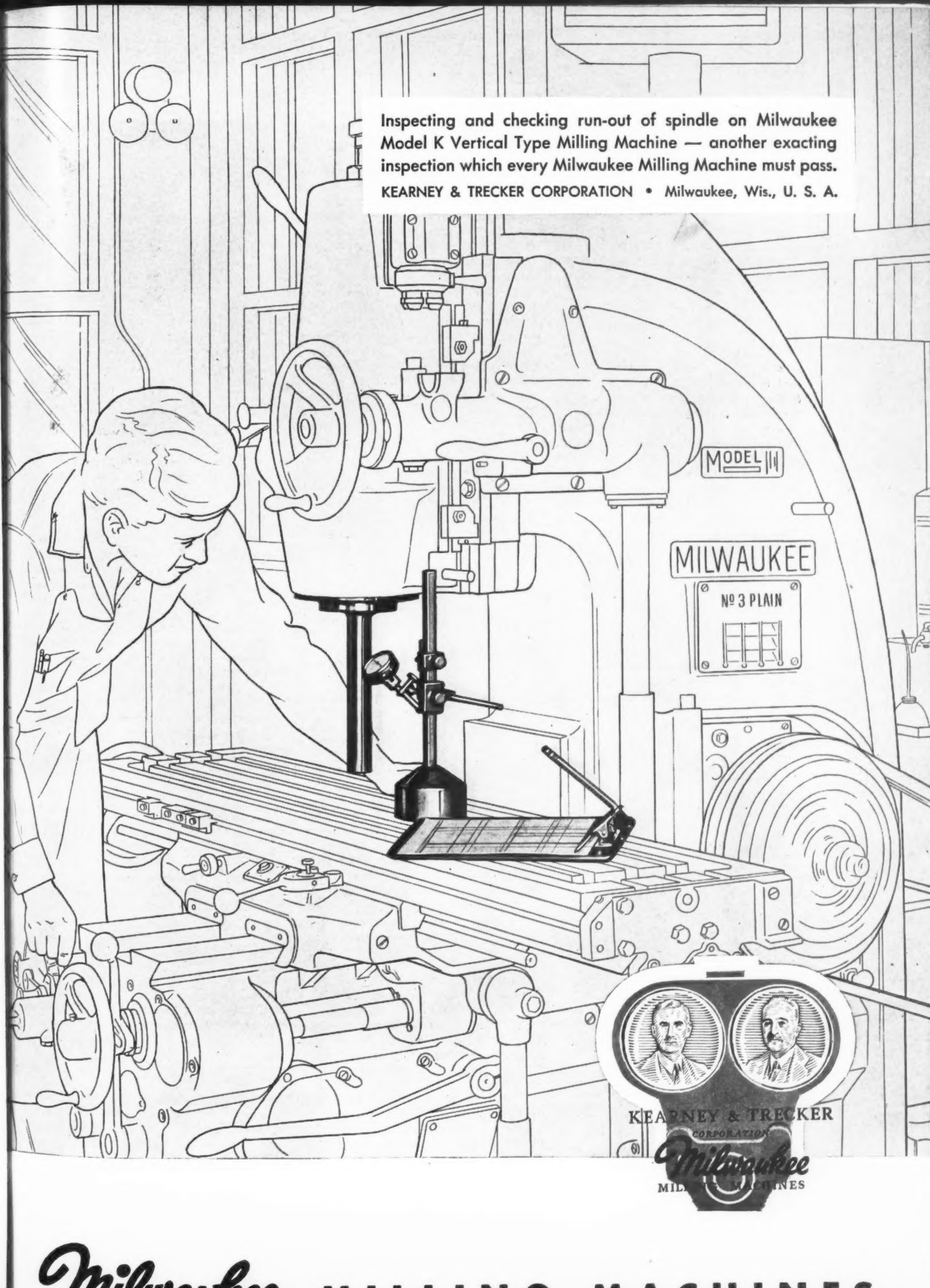
WESTERN ELECTRIC CO., 195 Broadway, New York City, announces that its subsidiary—ELECTRICAL RESEARCH PRODUCTS, INC.—has been merged into the parent company, and its domestic activities are hereafter to be carried on as the Electrical Research Products Division of the Western Electric Co. T. KENNEDY STEVENSON, former president of the subsidiary, becomes vice-president of the Western Electric Co.

BRUCE R. PRENTICE has been promoted to the position of engineer of the Aeronautics Equipment Division of the General Electric Co., Schenectady, N. Y.; KENNETH R. BOWMAN has been made assistant engineer; and HARLEY H. BIXLER, mechanical engineer on special assignments.

R. J. FORKEY has been appointed sales engineer for upper and western New York State by the Norton Co., Worcester, Mass. Mr. Forkey has been connected with the research laboratories and the sales engineering department at the Worcester pant.

STANLEY BRACKEN has been appointed general manager of manufacture of the Western Electric Co., New York City. He has been with the Western Electric Co. for twenty-nine years, having held many responsible positions with the company.

W. H. WILLS, chief metallurgist of the Allegheny Ludlum Steel Corporation at Dunkirk, N. Y., spoke on the


MODEL
MILWAUKEE
Nº 3 PLAIN
KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

subject "Molybdenum in High-Speed Steels," October 3, before the Pittsburgh chapter of the American Society of Tool Engineers.

JOHN R. CASSELL CO., INC., 110 W. 42nd St., New York City, has recently been appointed distributor in the New York metropolitan district for the Wickes Simplex blueprinting machines manufactured by Wickes Brothers, Saginaw, Mich.

Ohio

W. C. SAYLE, vice-president and general manager of the Cleveland Punch & Shear Works Co., has been elected president of the company, succeeding his father, the late Walter D. Sayle. The new president became associated with the company in June, 1908, after attending Cornell University, and acquired a practical knowledge of machine shop practice through active participation in the work of the various departments. The growth of the business soon necessitated the gradual assumption of greater responsibilities, and it was not long before he organized the Small Tool Division, which he managed for several years. In 1914, he was appointed to the position of executive vice-president and general manager of the entire organization, which position he has held until his election as president. Mr. Sayle is actively interested in the work of both the Associated Industries of Cleveland and the National Metal Trades Association, and has served as president and treasurer of the Cleveland branch of the latter Association.

W. C. Sayle, Newly Elected President of the Cleveland Punch & Shear Works Co.

LIEUTENANT HENRIQUE CALDERON, of the Nicaraguan Air Force, is visiting the Hobart Trade School, Troy, Ohio. He has been sent to this country to become familiar with American methods of constructing light planes and to study speed-ups in assembly line production. For two months he was at the Pan-American Airlines work shops at Brownsville, Tex., and after he has acquired a thorough knowledge of the Waco and Hobart factories, he will go to the Wright Motors plant at Paterson, N. J., completing a six months' assignment for his government in this country. This visit of Lieutenant Calderon is in accordance with the U. S. Government's arrangements to permit sixteen trained pilots from eight Latin American republics to start "refresher" training courses in America.

COLD METAL PROCESS CO., Youngstown, Ohio, announces the organization of a subsidiary company—the COLD METAL PRODUCTS CO.—which will take over two divisions of the parent concern, as follows: The designing and building of rolling mills and accessory equipment; and the Strip Steel Division, which produces special sizes and qualities of precision cold-rolled strip steel. The officers of the new subsidiary are L. A. Beeghly, chairman of the board; V. J. Lamb, president; H. S. Lamb, vice-president; W. H. Kilcawley, secretary-treasurer; W. B. Lockwood, general manager; and C. M. Beeghly, manager of the Strip Steel Division. The offices will be at the main plant in Youngstown.

SHEFFIELD CORPORATION, Dayton, Ohio, has awarded two five-year scholarships at the Department of Mechanical Engineering of the College of Engineering and Commerce of the University of Cincinnati to two of its younger employes, HOWARD GEBHART and CARL L. HOFFMEYER. The awards are known as the Elizabeth L. and O. M. Poock (parents of Louis Poock, the president of the Sheffield Corporation) scholarships, and are valued at approximately $2000 each.

MONARCH MACHINE TOOL CO., Sidney, Ohio, recently started operations in a $625,000 addition to its plant. At the opening a group of United States Navy officers visited the plant to inspect the manufacture of lathes for national defense.

J. T. HIVELY has been appointed director of public relations of the Denison Engineering Co., 119 W. Chestnut St., Columbus, Ohio. Mr. Hively will be in charge of personnel, government priorities, government reports, and plant protection, and will act as company representative to the Selective Service Boards.

C. C. Swift, Recently Elected President of the Ohio Machine Tool Co.

C. C. SWIFT, secretary and treasurer of the Ohio Machine Tool Co., Kenton, Ohio, since 1911, was elected president of the company at a recent meeting of the board of directors, to succeed the late Walter D. Sayle.

PAUL M. JANKO has been made sales manager of Moslo Machinery, Inc., 4516 Superior Ave., Cleveland, Ohio. R. C. BURTON has recently been added to the staff of the company, and will direct the advertising and sales promotional activities.

OHIO MACHINE TOOL CO., Kenton, Ohio, has completed a fireproof brick and steel addition to its plant. The assembly floor area has been more than doubled, and the loading and shipping space has been considerably increased.

GEORGE J. HUEBNER, publisher of the "Tool & Die Journal," Cleveland, Ohio, has been called to Washington to act as tooling consultant in the new Contract Distribution Division of the Office of Production Management.

HARLAN H. NEWELL has been elected treasurer and a member of the board of directors of the Cleveland Automatic Machine Co., Cleveland, Ohio.

Pennsylvania

W. R. BREELER, associate director of research of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., recently read a paper entitled "Molybdenum High-Speed Steels" before the American Society for Metals at Rockford, Ill. Mr. Breeler also gave a talk on the same subject before the Tri-State Chapter of the American Society

DoAll cuts WHOPPERS

LIKE THIS

1850 POUND DIE

No, it's not a big Wisconsin cheese, but a solid steel die (10" thick, 33" diameter) weighing 500 pounds more than the DoAll Machine on which it was cut in the plant of the Midwest Pipe & Supply Co., St. Louis, Mo.

"GLASS BOOT" DIE PARTS

Here's an assembly die sawed and filed in 90 minutes at the Taylor Instrument plant, Rochester, N. Y This die makes parts for the famous "glass boot" used in modern hospitals.

FASTEST METHOD

of Removing Metal

Makes no difference what it is—aluminum, brass, bronze, copper, iron, steel, nickel, zinc—any kind of metal, alloy or plastic—forgings, castings, tubing, blocks or sheets—the DoAll cuts it with savings of time and metal that are astonishing.

Takes the place of shaper, milling and lathe work on hundreds of different jobs in large and small defense and industrial plants everywhere. In addition to internal and external sawing, the DoAll does band filing and polishing.

IT WILL PAY YOU to have one of our factory trained men call at your plant to show you what a DoAll can save you.

FREE—Literature and 158-page Handbook on Contour Machining

DO-ALL Contour Machine BAND SAWING BAND FILING BAND POLISHING

3-OUNCE GASKETS

Cutting gaskets—generally a pain in the neck—is easy with a DoAll. The paper is screwed between two plates, the cut made through the plates, maintaining smooth edges on gaskets.

CONTINENTAL MACHINES, INC.

1312 S. Washington Avenue Minneapolis, Minn.

Associated with the DoAll Company, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

of Tool Engineers on October 8, in Springfield, Vt. This subject is of especial interest at the present time because of the importance of molybdenum high-speed steel in defense production.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa., has announced that, in the interest of national defense, the company is giving up its exclusive right to the registered trademark "Alclad." This trademark, under which certain aluminum materials broadly used in the aircraft and other defense industries have been sold for fourteen years, is well known by aircraft, military, and naval designers.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., has recently completed and placed in operation at its West Leechburg, Pa., plant a four-high rolling mill, and has also made an addition to the electric furnace department at its Brackenbridge, Pa., plant that will increase the company's melting capacity of stainless and other high-alloy steels by 50,000 tons a year.

WILLIAM F. LAMOREAUX has been appointed Director of Research of the Meehanite Metal Corporation, Pittsburgh, Pa. Mr. Lamoreaux has had extensive experience in research in both the metallurgical and chemical fields, and was for many years vice-president, general manager, and director of the Ducktown Chemical & Iron Co., Isabella, Tenn.

GENERAL ELECTRIC CO. (Erie Works), Erie, Pa., has been honored by the Navy "E" pennant for outstanding achievements in the production of naval equipment. The employes of the works also have been presented with the special lapel buttons that accompany the award.

ROBERT PAXTON has been appointed manager of the Philadelphia Works of the General Electric Co., Schenectady, N. Y. Mr. Paxton was previously assistant to the manager of the Philadelphia Works.

EDGAR F. HECKERT has been appointed special assistant to the general works manager of the York Ice Machinery Corporation, York, Pa. Mr. Heckert has been with the corporation since 1909.

* * *

Monarch Completes 25,000th Engine Lathe

The completion by the Monarch Machine Tool Co., Sidney, Ohio, of its twenty-five thousandth engine lathe was made the occasion by the employes of the company of a surprise party in honor of Wendell E. Whipp, the company's president, on September 23. A group of thirty-four men who have been in the employ of the company for over twenty years appeared unannounced at Mr. Whipp's home on the evening of that day. Charles E. Buehler, a patternmaker, who is the oldest employe of the company, having been connected with the company for thirty-two years, presented Mr. Whipp with a bronze plaque of the plant.

Mr. Whipp became associated with the Monarch company twenty-nine years ago, and has seen it grow from a small enterprise to one of the large machine tool manufacturing plants in the country, now employing 1500 men and covering 185,000 square feet of floor space. This year, the company expects to build 3500 lathes, all for the Defense Program of the United States and Great Britain.

Standard Steel Works Receives Navy "E" Pennant

The Standard Steel Works Division of the Baldwin Locomotive Works, located at Burnham, Pa., has been awarded the Navy Department "E" pennant and the Bureau of Ordnance flag for "outstanding production of Navy ordnance." Three thousand employes, officials, and their families were present when Rear Admiral George T. Pettengill, Commandant of the Navy Yard and Superintendent of the Naval Gun Factory, Washington, D. C., presented the award to Charles E. Brinley, president of the Baldwin Locomotive Works, who accepted the honor on behalf of the employes of the Standard Steel Works.

In addition to the Navy "E" pennant and the Bureau of Ordnance flag, each employe of the Standard Steel Works was awarded a lapel button bearing the Navy "E" insignia. Two employes, John McCurry, Sr., and Bernard T. Shields, both employed at the Standard Steel Works for over fifty-four years, were selected to receive the first two Navy "E" buttons. The Standard Steel Works traces its origin to the Freedom Forge established in Burnham, Pa., in 1795.

* * *

G.E. Defense Orders

Orders received by the General Electric Co., Schenectady, N. Y., during the first nine months of this year reached a total of $831,390,000, compared with $397,810,000 for the same period last year. Of these orders, those definitely known to cover equipment for national defense purposes amounted to approximately $412,000,000.

One of four Timken tapered roller bearings installed on the back-up rolls of the new four-high reversing hot mill of the Aluminum Co. of America at Alcoa, Tenn. These bearings have a bore of 35 1/2 inches, a width of 36 inches, and an outside diameter of 51 inches. They weigh over 9000 pounds each, and are capable of sustaining a load of 8,300,000 pounds at mill speed. Each bearing is a four-cage assembly with 34 case-carburized rolls per cage, or a total of 136 rolls per bearing. Each roll is 4 inches in diameter, 7 1/4 inches long, and weighs nearly 24 pounds. The bearings are said to have 30 per cent greater capacity than any bearings ever built.

Navy "E" Pennant Awarded to Mesta Machine Co.

The Mesta Machine Co., Pittsburgh, Pa., has been awarded the Ordnance flag and the Navy "E" pennant for producing an ever increasing amount of ordnance for the United States Navy.

At the time of the presentation of the award, the Secretary of the Navy, Frank Knox, sent the following telegram to Lorenz Iverson, president of the company: "The splendid achievement of the Mesta Machine Co., its management and its employes, in producing an ever growing output of ordnance for the United States Navy, is characteristic of the vigor, intelligence, and patriotism which have made America great and which have kept her free. On this occasion of public recognition of your accomplishment, please accept my congratulations."

COMING EVENTS

NOVEMBER 6-8 — Fourth annual NATIONAL TIME AND MOTION STUDY CLINIC at the Chicago Towers Club, under the auspices of the Industrial Management Society, 205 W. Wacker Drive, Chicago, Ill.

NOVEMBER 13-14—National Transportation and Maintenance Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at Hotel Statler, Cleveland, Ohio.

DECEMBER 1-5 — Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Astor, New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

DECEMBER 1-6 — EIGHTEENTH EXPOSITION OF THE CHEMICAL INDUSTRIES at Grand Central Palace, New York City. For further information, address Exposition of Chemical Industries, Grand Central Palace, New York City.

JANUARY 12-16, 1942 — Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Book Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

MARCH 23-25, 1942—Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in Houston, Tex.

JUNE 8-10, 1942—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in Cleveland, Ohio.

OBITUARIES

Henry Buker

Henry Buker, vice-president of the Brown & Sharpe Mfg. Co., Providence, R. I., died on September 29 at the Jane Brown Hospital in Providence after a brief illness. He was taken ill recently while on a vacation in Canada. He was in his sixty-eighth year. Starting as an apprentice, he became a prominent leader in the machine tool industry. He had been continuously identified with the Brown & Sharpe Mfg. Co. for forty-nine years.

Mr. Buker was born in 1873 at Exeter, N. H. He was educated at the Phillips-Exeter Academy, graduating in 1892. He then served a complete apprenticeship with the Brown & Sharpe Mfg. Co., meanwhile attending evening courses at the Rhode Island School of Design, from which he graduated in 1895. After spending two years abroad to acquire a speaking knowledge of French and German, he represented the Brown & Sharpe Mfg. Co. at the World's Fair in Paris in 1900. Upon his return, he was placed in charge of the company's small tool department. In 1908, he took charge of sales of the gear department and foundry. Beginning in 1910, he had charge of the company's sales office in Chicago for four years, afterward returning to Providence.

In 1917, Mr. Buker was made general sales manager and assistant secretary; in 1924, he was made vice-president; and in 1937, he became one of the members of the first board of directors established by the company. He also was president and director of Brown & Sharpe of New York, Inc., and of the Brown & Sharpe Co., both of which are selling organizations of the parent firm.

In addition to his duties with the Brown & Sharpe organization, Mr. Buker gave much attention to the interests of the machine tool industry as a whole. He was elected president of the National Machine Tool Builders' Association in 1928, and for several years was a director of that Association. In 1933, he was elected chairman of the NRA Code Authority for the machine tool and forging machinery industries. This was perhaps one of the most important of the many posts he filled during his business career. He had been a member of the machine tool industry's permanent committee dealing with national defense problems since its formation in June, 1940.

His sense of responsibility and the dependability with which he carried through every task that he undertook, coupled with a keen sense of humor, won him a host of friends, not only in the machine tool industry and among his company's customers, but in every circle with which he came in contact. His many friends will learn of his passing with deep regret.

Mr. Buker was married in 1902 to Mary Foster York, of Kensington, N. H., who survives him.

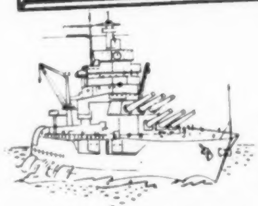
William LeRoy Emmet

William LeRoy Emmet, consulting engineer of the General Electric Co., Schenectady, N. Y., and well known for his outstanding contributions to power generation and ship propulsion, died on September 26, aged eighty-two, at the home of his nephew, H. L. R. Emmet, manager of the General Electric Works at Erie, Pa. He had been suffering from a heart ailment.

Mr. Emmet was born in Pelham, N. Y., in 1859. He graduated from the United States Naval Academy in 1881. He first became associated with electrical work in 1887, when he entered the employ of the Sprague Electric Railway & Motor Co. Later, he became connected with the Edison General Electric Co. in the Chicago district. He went to Schenectady in 1892 when the Thomson-Houston Co. was joined with the Edison General Electric Co. to form the General Electric Co.

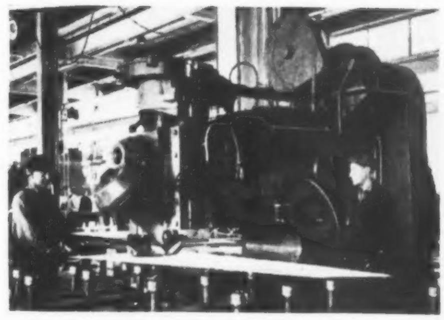
Mr. Emmet was largely responsible for the adoption of the steam turbine for central station power generation, 122 patents having been issued in his name. As early as 1909, he pointed out that electric ship propulsion was feasible and economical. Largely through his efforts, the Navy Department, in 1913, installed a turbine-electric drive in the collier *Jupiter*. The success of this installation led to the adoption

Where They Can't Wait for a New Machine
-The Versatile QUICKWORK
Works for the NAVY



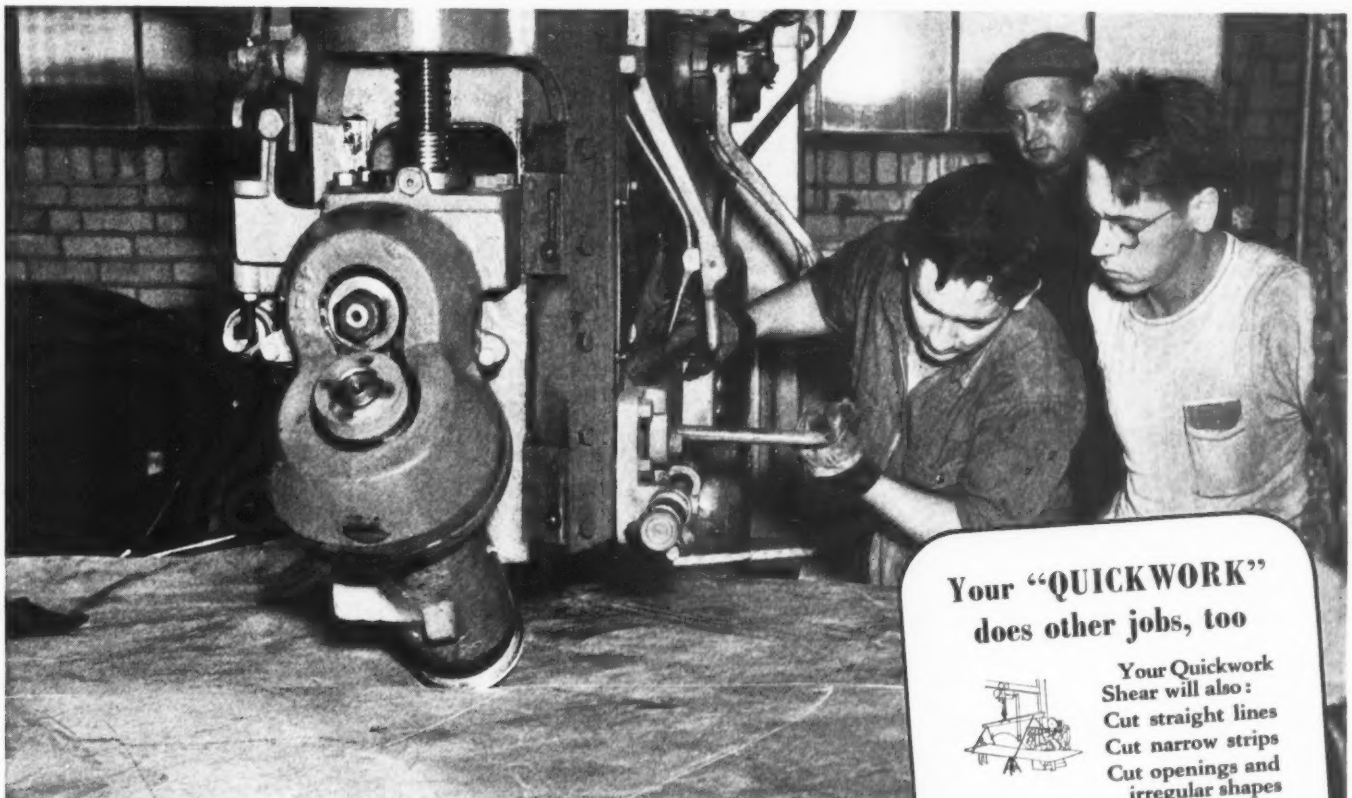
Cutting irregular contours or straight lines; openings or narrowstrips; beveling, circling; flanging or joggling, versatile Quickwork-Whiting Rotary Shears speed the Navy's ship building program in many shipyards. Quickwork Shears are also on defense duty in aircraft and tank factories, steel mills, and many other defense shops where they perform countless complicated operations accurately and at high speeds—on all types of sheet and plate up to one inch mild steel.

Don't wait for a new machine. Remember your "Quickwork."



Above: This Quickwork-Whiting Rotary Shear slits steel plates at the Bath Iron Works.

Below: Another installation at the New York Ship Building Corporation, where a Quickwork is shown cutting through a copper nickel condenser head for the U. S. Navy.



Your "QUICKWORK" does other jobs, too

Your Quickwork Shear will also:
Cut straight lines
Cut narrow strips
Cut openings and irregular shapes
Cut beveled edges
Flange and joggle
Make clean cuts without burrs—in a single pass at high speeds.

Don't wait for a new machine. Use your Quickwork.

"QUICKWORK" WHITING

Division of Whiting Corporation, 15673 Lathrop Ave., Harvey, Illinois

of the electric drive for a number of large warships. The General Electric Co. produced geared turbine equipment for forty destroyers and three hundred merchant ships from 1915 to 1922.

Mr. Emmet is also known for his work on the mercury vapor process, which has been applied successfully to the generation of power. He was active in the electrical field as well, attaining prominence through his work in encouraging the use of alternating current. He made a significant contribution to the field of electrical insulations, and invented several types of transformers. His most brilliant accomplishments, however, were as an originator of new methods and ideas. A great deal of his most useful work could not be patented, nor, perhaps, even be classified as invention.

Mr. Emmet received the honorary degree of doctor of science from Union College in 1910, and later the same degree from Trinity College. He was awarded the Gold Medal at the St. Louis Exposition in 1904 for his work in developing the vertical-shaft turbine, and at the San Francisco Exposition, in 1915, for electric ship propulsion. He was also awarded the Elliott-Cresson Medal in 1920.

James B. Dillard

Colonel James Brownrigg Dillard, general superintendent of the Cleveland Twist Drill Co. for the last eighteen years, died suddenly of a heart attack at his farm at Clifford, Va., on September 28. He was a graduate of West Point, class of 1904, and served as an ordnance officer during the first World War, at which time he was awarded the Distinguished Service Medal. He was a member of the American Society of Mechanical Engineers, the American Society for Metals, the Army and Navy Club of Washington, and man other organizations.

Colonel Dillard is survived by his second wife, Doris Portmann Dillard, and three children, Mrs. Charles J. Kenny, of Charlottesville, Va.; Heath Portmann, and David Brownrigg.

Charles Lorenzo Clarke, the oldest of the Edison pioneers and the last of seventy-one charter members of the American Institute of Electrical Engineers, died of pneumonia on October 9 at his home in Newton, Mass., aged eighty-eight years.

Mr. Clarke was born in Portland, Me., on April 16, 1853. Upon graduating from high school, he went to work for the Boston & Maine Railroad, later studying at Bowdoin College. He became connected with Thomas A. Edison in 1880, first as research assistant and later as chief engineer. Leaving the Edison Company in 1884, Mr. Clarke became engineer for the Telemeter Co. and later for the Gibson Electric Co., In 1889, he became a consulting engineer specializing in patent work. He served as engineer for the board of patent control of the General Electric Co. and the Westinghouse Electric & Mfg. Co. from 1901 to 1911, when he was appointed consulting engineer for the General Electric Co., with whom he was connected until his retirement ten years ago.

Mr. Clarke was a member of the American Society of Mechanical Engineers, the New York Electrical Society, and an honorary fellow of the American Electro-therapeutic Association. He held bachelor of science, master of science, and civil engineering degrees.

John L. Osborne, assistant general superintendent of the General Railway Signal Co., Rochester, N. Y., died suddenly on September 20, at his home in Rochester, aged sixty-one years. Mr. Osborne had been an employe of the General Railway Signal Co. for approximately twenty-five years. He was a highly important man in the company's defense program, as he had supervised work on the large national defense contracts held by the company.

O. V. Strand, of the firm of N. A. Strand & Co., Chicago, Ill., died on October 17 after a short illness.

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Pratt & Whitney Honors Employes of Long Service

Seventy employes of the Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., recently received gold service emblems in recognition of the fact that during the last few months they had completed another decade of service. In this group, there were thirty-nine men who received 10-year pins; thirteen. 20-year pins; ten, 30-year pins; six, 40-year pins; and two, 50-year pins. The pins are of solid gold carrying varying numbers of diamonds according to length of service. The 50-year pins carry one large diamond.

Pratt & Whitney Employes, Who Recently Received Gold Service Emblems for Varying Lengths of Service from Ten to Fifty Years